AVIATION WEEK

MAY 10, 1954

50 CENTS

A McGRAW-HILL PUBLICATION

GLOBE, COURTESY ROBERT ANSTEAD JEWELER, LOS ANGELES

CONVAIR...first choice all over the world! Thirty airlines have chosen CONVAIR fleets for *your* air travel comfort and speed. Ask your favorite airline or travel agent to make *your* next flight a Convair...world's most popular passenger plane!

How the Holley Turbine Control helps jet pilots concentrate on FIGHTING, not flying

Nearly every foot of altitude, gained or lost, nearly every minute change in atmospheric conditions alters the amount of fuel flow needed by today's jet engine. Literally hundreds of mathematical problems must be solved every minute a jet is in the air. It would be impossible for any pilot to solve all these problems and still have time to concentrate on fighting. So the Holley Turbine Control was developed to solve them for him AUTOMATICALLY.

Holley's research department played an important role in the development of this mechanical wizard. But producing Holley Turbine Controls requires special skills, too. Working to tolerances of as little as plus or minus 25 millionths of an inch, the Holley manufacturing division turns out turbine controls for thousands of today's jet aircraft.

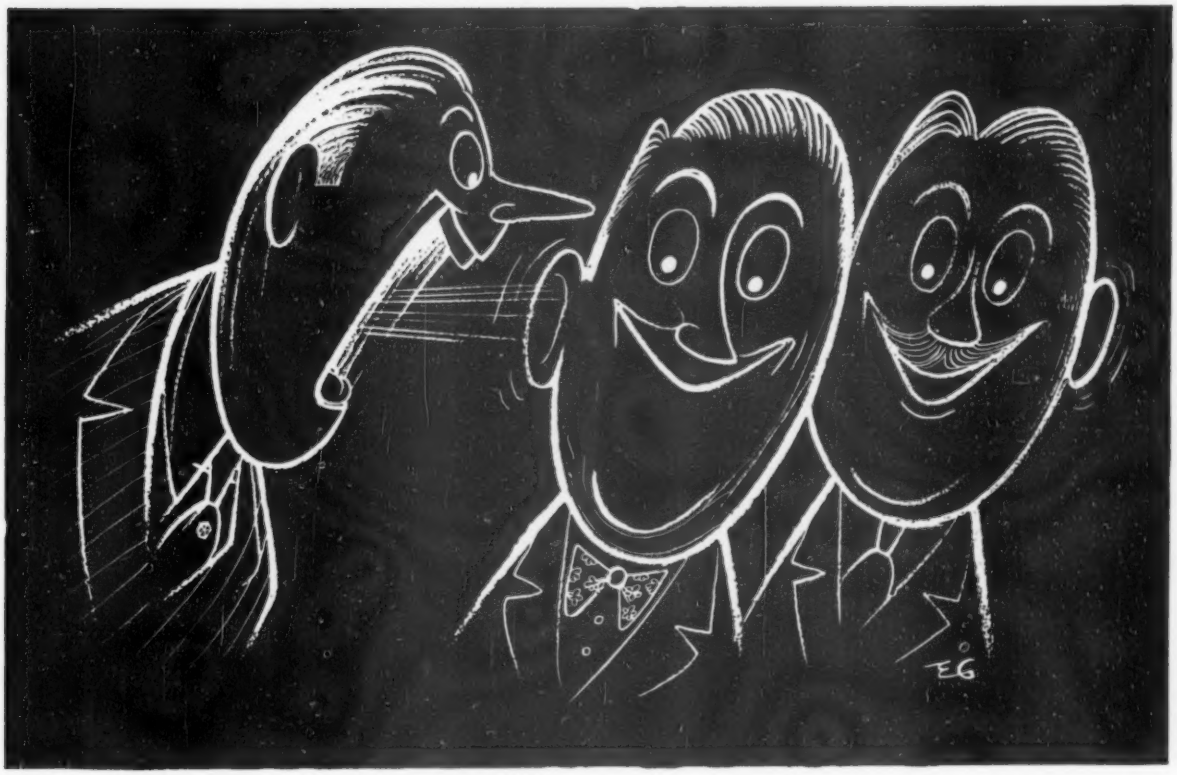
Holley's highly-trained research, engineering and manufacturing staff can support your program of producing better products for the aviation industry, either your design or ours.

Leader in the design, development, and manufacture of aviation fuel metering devices.

HOLLEY Carburetor Co.

VAN DYKE, MICHIGAN

A-19



What's all this talk about PNEUMATICS ?

Men like George Medhurst were talking — and doing something about pneumatics years ago. As early as 1800, Mr. Medhurst took out patents in England for a pneumatic automobile! But today, the brightest future for pneumatics is in the field of aviation. It's easy to see why, when you look at the tremendous advantages of pneumatic systems for aircraft.

Pneumatic systems are light and safe — and since air does the work, you're sure of an unlimited supply. What's more, there's no fire hazard, no danger of system breakdown from minor leaks. And pneumatic systems operate efficiently over an extremely wide temperature range . . . will give you all the power you need, from a feather touch to a pile-driver punch.

The heart of a pneumatic system is the compressor, and Kidde has a 3000 psi compressor the size of a table radio—the lightest, most efficient on the market today. Kidde also designs and makes pneumatic components such as pressure reducers, air fuses, 2 and 3-way solenoid control valves, dehumidifying equipment. Today Kidde can engineer and furnish a complete *pneumatic system.*

We here at Kidde are constantly on the watch for new applications of this exciting force. We think it fortunate that we were among the first to explore this fascinating field.

Perhaps you, too, are investigating this power of tomorrow. If you have any problems in pneumatics, write us.

The words 'Kidde', 'Lux' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

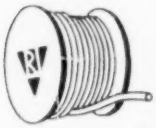
Kidde

Walter Kidde & Company, Inc.
518 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal — Toronto

ELIMINATE HEADACHES!

...in purchasing

VINYL SLEEVING



Problems in buying vinyl sleeving are far fewer when you do business with Resin Industries for these reasons: Strict adherence to exacting specifications. Meticulous compounding by skilled chemists. Precision workmanship. Absolute uniformity. Rigid quality control. Prompt and understanding service. That's why Resinite is the largest supplier of vinyl sleeving to the aircraft industry. Write for samples and prices.

Resinite

RESIN INDUSTRIES, INC.

315 Olive St. • Box 1589 • Santa Barbara, Calif.

SPECIALISTS IN VINYL SLEEVING AND TUBING FOR THE AIRCRAFT, ELECTRONICS AND PHARMACEUTICAL FIELDS

Resin Industries, Inc.
Box 1589, Santa Barbara, Calif.
Please send samples and prices of sleeving as follows:

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

Aviation Week

May 10, 1954 Vol. 60, No. 19

Editorial Offices
New York 36—330 W. 42nd St., Phone LOngacre 4-3000 (Night LO 4-3035)
Washington 4, D. C.—National Press Bldg., Phone NAtional 8-3414
Los Angeles 17—1111 Wilshire Blvd., Phone MAdison 6-4323

Table of Contents on Page 8

52,068 copies of this issue printed

Robert W. Martin, Jr. ..... *Publisher*
Robert H. Wood ..... *Editor*

Robert B. Hotz
Executive Editor

Merlin H. Mickel
Managing Editor

Albert W. Bentz ..... News Editor
David A. Anderton ..... Engineering
Irving Stone ..... Technical
G. L. Christian ..... Equipment, Maintenance
Katherine Johnsen ..... Congress
Philip Klass ..... Avionics
Claude O. Witze ..... Military
Richard Balentine ..... Transport
Frank Shea, Jr. ..... Transport

Erwin J. Bulban ..... Special Assignments
William J. Coughlin ..... West Coast
Bernie Lang ..... West Coast Assistant
Henry Lefer ..... News Desk
Gordon C. Conley ..... News Desk
G. J. McAllister ..... Washington News Desk
Lawrence J. Herb ..... Art Editor
Victoria Giaculli ..... Editorial Makeup
Leo T. Tarpey ..... Printing & Production

DOMESTIC NEWS BUREAUS

Atlanta 3 ..... 801 Rhodes-Haverty Bldg.
Chicago 11 ..... 520 No. Michigan Ave.
Cleveland 15 ..... 1510 Hanna Bldg.
Detroit 26 ..... 856 Penobscot Bldg.
Houston 25 ..... 1303 Prudential Bldg.
Los Angeles 17 ..... 1111 Wilshire Blvd.
San Francisco 4 ..... 68 Post St.
Washington 4 ..... 1189 National Press Bldg.

FOREIGN NEWS SERVICE

Editor ..... Joseph K. Van Denburg, Jr.
London ..... Edward W. S. Hull
Paris ..... John O. Coppock
Bonn ..... Gerald W. Schroder
Manila ..... Herbert Leopold
Mexico City ..... John Wilhelm
Sao Paulo ..... Lionel J. Holmes
Tokyo ..... Alpheus W. Jessup

Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

Research and Marketing: Mary Detwiler, Jane Grube and Mary Whitney.

J. G. Johnson ..... *Business Manager*

Sales Representatives: J. C. Anthony, **New York**; H. P. Johnson, **Cleveland**; D. T. Brennan and J. S. Costello, **Chicago** and **St. Louis**; E. P. Blanchard, Jr., **Boston**; James Cash, **Dallas**; William D. Lanier, Jr., **Atlanta**; R. E. Dorland, **San Francisco**; C. F. McReynolds and Gordon Jones, **Los Angeles**; W. S. Hessey, **Philadelphia**; C. A. Ransdell, **Detroit**. Other sales offices in **Pittsburgh**, **London**.

AVIATION WEEK • May 10, 1954 • Vol. 60, No. 19
Member ABP and ABC

Published weekly by McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. **Publication Office: 99-129 North Broadway, Albany 1, N. Y.**

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Donald C. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 W. 42nd St., New York 36, N. Y. Allow 10 days for change of address.

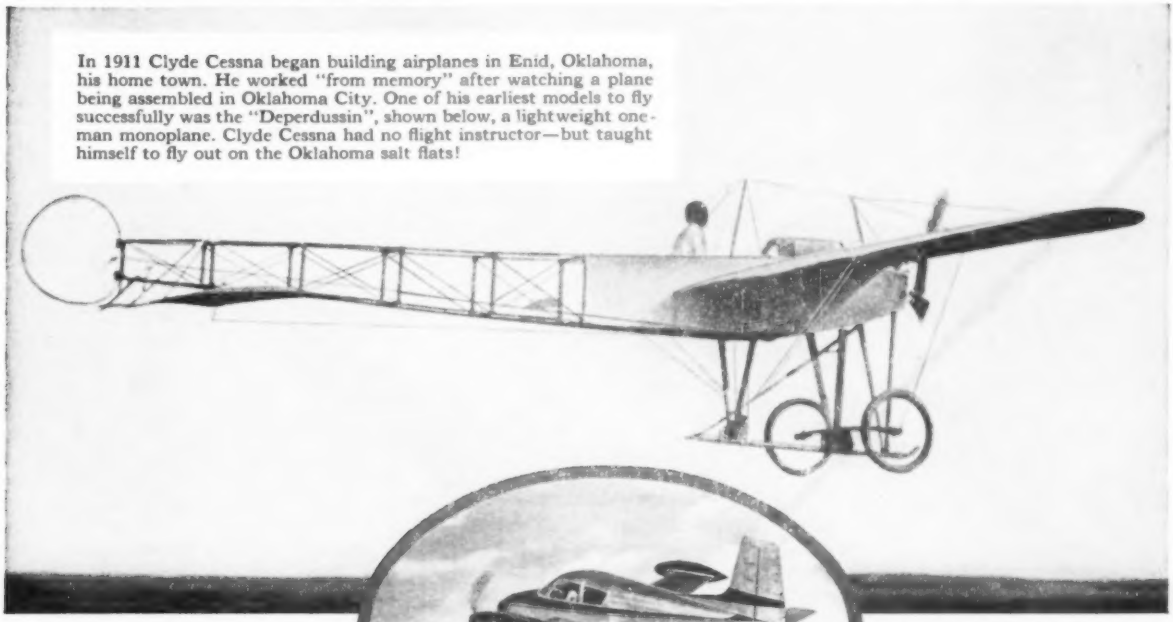
Subscriptions are solicited only from persons having a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.

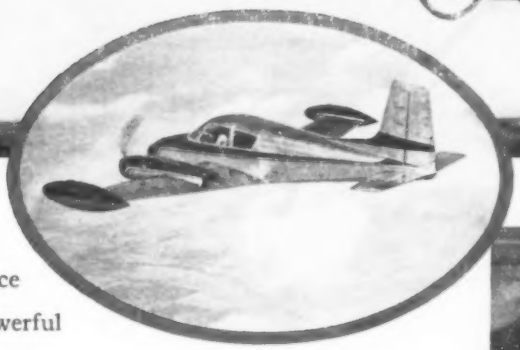
Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par. Other Western Hemisphere, $10 a year; $16 for two years; $20 for three years. All other countries, $20 a year; $30 for two years; $40 for three years. Entered as second-class matter, July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A. Copyright 1954 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Cable Address: "McGraw-Hill New York." Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL. All rights to these names are reserved by McGraw-Hill Publishing Co.

FLYING THE "DEPERDUSSIN"

One of Cessna's Early Airplanes

In 1911 Clyde Cessna began building airplanes in Enid, Oklahoma, his home town. He worked "from memory" after watching a plane being assembled in Oklahoma City. One of his earliest models to fly successfully was the "Deperdussin", shown below, a lightweight one-man monoplane. Clyde Cessna had no flight instructor—but taught himself to fly out on the Oklahoma salt flats!





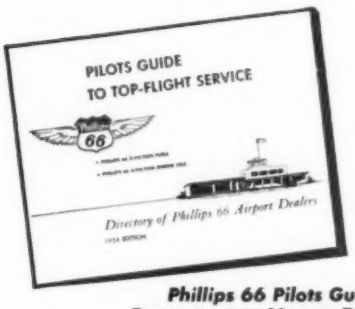
The Cessna "top-level" Executive— Model 310

As the science of flight developed through the years, petroleum research kept pace with the demands for more powerful and efficient aviation fuels.

Phillips Petroleum Company is today one of the country's largest suppliers of aviation fuels for military, commercial and private use.

In addition to a tremendous capacity for producing 115/145 grade aviation gasoline, Phillips is ready with improved fuels for the latest designs in turbo-props and jets. Always depend on Phillips for reliable aviation products.

Only a few years after his first flight, Clyde Cessna established his own airplane manufacturing company specializing in the production of private planes. Today, Cessna Aircraft Company is famous for building safe, dependable airplanes which are rapidly becoming "tools of the trade" in many businesses. Shown above are Dwane Wallace, left, President; and right, his uncle, Clyde Cessna, founder.



Phillips 66 Pilots Guide
Free at your Airport Dealers'

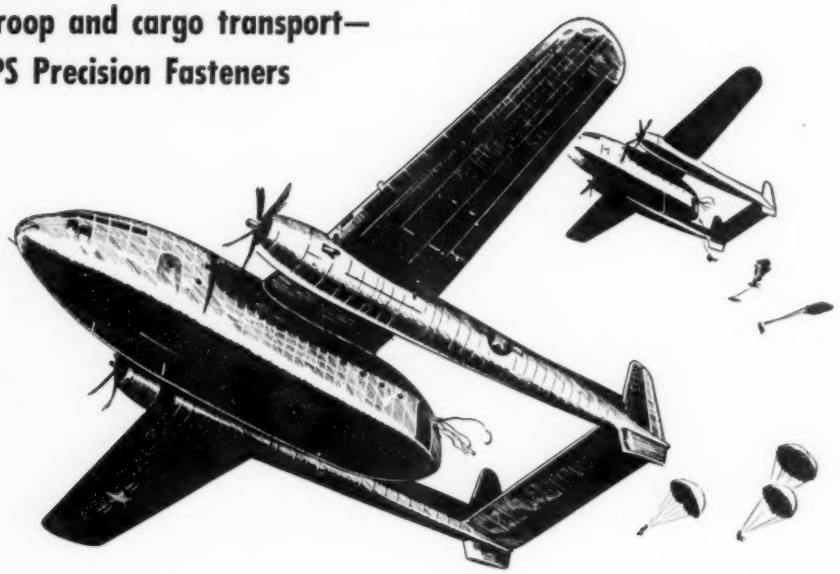
Used along with a handy Phillips 66 Credit Card, this directory of Phillips 66 Airport Dealers will be helpful to pilots.

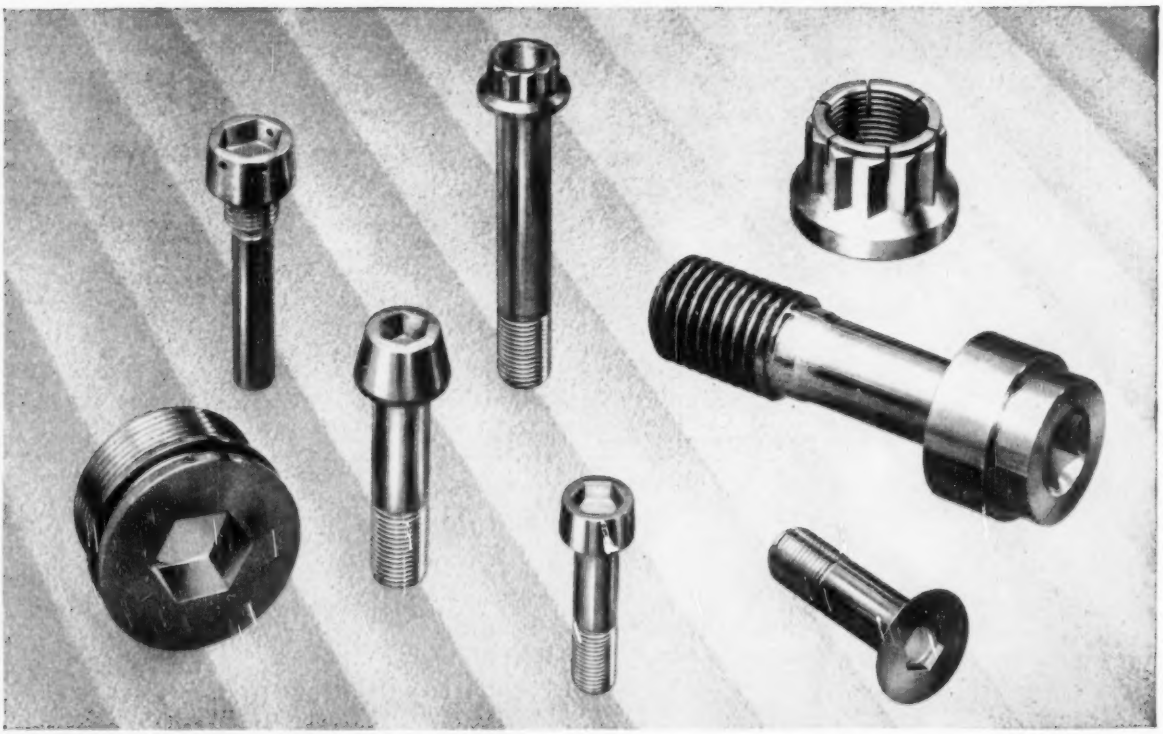
AVIATION DIVISION
PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA

Phillips 66

AVIATION PRODUCTS

The Fairchild C-119 Flying Boxcar
—standard troop and cargo transport—
uses SPS Precision Fasteners





A typical selection of SPS fasteners. For complete information, write STANDARD PRESSED STEEL CO., Jenkintown 3, Pa.

AIRCRAFT PRODUCTS DIVISION **SPS**
JENKINTOWN PENNSYLVANIA

NEWS DIGEST

Domestic

Vertical-takeoff transport development will be started this year by the Cornell-Guggenheim Aviation Safety Center in New York. First step will be a technical study of Navy's VTO fighters, several types of convertiplanes, experimental aircraft that use boundary-layer control and helicopters.

Avgas sales at U.S. Air Force bases last week were restricted by new regulations to commercial airlines that could pay cash or guarantee their accounts through authorized suppliers. Contract operators were able to obtain credit by posting a surety bond. The action stemmed from a Senate charge that delinquent bills went uncollected (AVIATION WEEK Apr. 5, p. 15.)

Walkout of 450 machinists occurred at Fairchild Engine & Airplane Corp.'s guided missiles plant at Wyandanch, N. Y., last week after the IAM local membership rejected a wage increase negotiated by management and a bargaining committee working with a federal mediator. Terms of the rejected agreement were not disclosed.

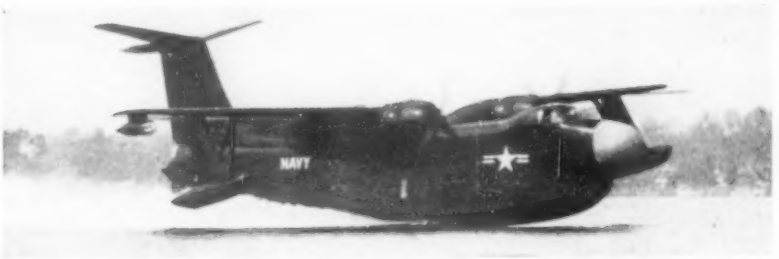
Administraton has submitted legislation to Congress that would increase control of the Undersecretary of Commerce for Transportation over allocation of airport funds and set up a new policy of "national importance" rather than local needs as the yardstick for federal aid.

Walter Sternberg, president of Resort Airlines, in a statement to AVIATION WEEK denies that he has been approached by Northwest Orient Airlines. Recent rumors mentioned him as the next NWA president.

Control of Link Aviation, Inc., last week was taken over by General Precision Equipment Corp., which purchased 95% of the Binghamton, N. Y., company's outstanding stock (AVIATION WEEK Mar. 22, p. 7). Link will continue to operate under its present management.

Military Air Transport Service will take over McGuire AFB, N. J., from the Air Defense Command July 1; is scheduled to transfer MATS Atlantic Division headquarters to the base and build up the field to one of the largest on the East Coast.

Beech Aircraft Corp. has set up $7 million in credit with the National City Bank of New York and the Fourth National Bank of Wichita to provide financing for commercial and export business, U.S. military contracts and subcontracts with other plane builders. The Wichita company also reports retirement of an $8-million V-loan.



Martin Flies First Production P5M-2

Readily distinguished from its earlier P5M-1 sister ship by the high-mounted T-tail, the first production Martin P5M-2 Marlin anti-sub flying boat ordered by Navy cuts the surface of Chesapeake Bay as it takes off on its first flight Apr. 29. The P5M-2 also differs from the P5M-1 in its lower bow chine which cuts down spray height during takeoff. Powered by two 3,400-hp. Wright R3350-32W Turbo Compound engines, the new Marlin has increased range, speed and higher takeoff gross weight.

Hiller Helicopters has reduced the price tag on its three-place 12-B craft from $36,000 to $33,400, will omit some accessory items on the commercial version that were required by military specifications.

Piasecki Helicopter Corp.'s $3,875,000 mortgage loan, authorized in 1951 to finance construction and equipping of new plant facilities at Morton, Pa., has been purchased by the Chase National Bank of New York from RFC, Philadelphia National Bank and the Tradesmens Land Title Bank and Trust Co., also of Philadelphia, participated.

Piper Aircraft Corp., Lock Haven, Pa., has sold 12 PA-18 Super Cubs powered by 135-hp. Lycoming engines to Colombia for civil pilot training.

Legislation establishing an Assistant Secretary of Defense for Continental Defense has been introduced by Rep. Sterling Cole, chairman of the Joint Congressional Atomic Energy Committee. The measure is pending before the House Armed Services Committee, of which Cole is a ranking member.

Rear Adm. Herbert V. Wiley (USN Ret.), dirigible pioneer who commanded Navy's ill-fated USS Macon and the only officer to survive the crash of the USS Akron, died Apr. 28 at Pasadena, Calif. He was 63.

Maurice W. Gotthelf, 63, public relations director for General Motors Corp.'s AC Spark Plug Division, died Apr. 22 in Chicago.

Financial

North American Aviation, Los Angeles, reports a net income of $8,850,000 for the six months ended Mar. 31, compared with $5,050,000 for the same period last year. Sales and income totaled $298,360,898. Backlog Mar. 31: $1,106,787,872.

Bell Aircraft Corp., Buffalo, N. Y., had a net income of $1,699,069 for the first quarter of 1954, 96% higher than the first three months of 1953. Sales and income totaled $45,190,014, compared with $35,005,590 last year. Backlog Apr. 3: $450,232,143.

Continental Air Lines had a net income of $126,023 for the first quarter of 1954, compared with $683,011 for the same period of 1953. This included a net operating income of $66,446 from $2,795,200 revenue ($35,690 net, $2,491,792 revenues last year).

American Airlines has declared a regular quarterly dividend of 87½ cents per share on $3.50 cumulative convertible preferred stock, payable June 1 to holders of record May 17.

Fairchild Engine & Airplane Corp., Hagerstown, Md., will pay 30-cent dividend May 28 on common shares to holders of record May 12.

International

Canadian aviation officials have denied a U.K. request to extend the bilateral air agreement to include landing rights for British Overseas Airways Corp. at Toronto's Malton Airport.

MONOGRAM SHEET METAL CLAMPS

HOLD TIGHT!

—because of this PRECISION CONSTRUCTION

PLUNGER – Extremely close tolerance is maintained between the case and plunger assuring movement of plunger in a straight line at all times which is a necessary feature for smooth operation and long life.

CASE – One piece case for greater strength. Fewer parts means greater durability.

SPRING – Of highest quality tempered steel. Manufactured to apply greater tension than required in order to draw the material tightly together and assure positive alignment at all times.

RETAINING WASHERS – Precision made to operate freely in case.

NEEDLE – Finest quality steel. Extreme care is taken to hold dimensional tolerance to .0001, assuring a more precise instrument. Because of these close tolerances and perfect alignment of all parts, the needles always move in unison and their clamping surfaces contact the metal simultaneously ... imperative for perfect material holding.

SPREAD BAR – Top quality steel. Tolerances are held exceptionally close for smooth, easy operation and correct expansion of the needles.

MONOGRAM
MANUFACTURING COMPANY
A DIVISION OF LEWIS AND KAUFMAN, LTD.
8557 Higuera Street, Culver City, California

The Aviation Week

May 10, 1954

Headline News

U.K.'s Best Bet Becomes Liability 13
Boundary-Layer Control for Jets 15
Airpower Cuts 16
Present Copters Inadequate: Army 17
Nike Batteries 18
Airlines Face Critical Decade 21
USAF Planning 'Flexible': Talbott 24
New Progress Pay Policy 26
H-Bomb Sparks Aussie Air Buildup 31

Aeronautical Engineering

Breaking the 'Runway Barrier' 34
Tiny Sportplanes Make Debut 37
How to Give Wings More Lift 42

Production

J&H Breaks Short-Run Logjam 47
Firebee Built for Fast Field Service 50

Avionics

Digital Computers Take to the Air 62

Equipment

BuAer Tests Silver-Zinc Battery 71

Financial

Aircraft Earnings Go Up Again 82

Air Transport

PAA Rides Coach to New Peaks 87
ATA Scores Subsidy Cut Plans 88
N.Y. Breaks Ground for Terminal 89
World's Airlines Set Safety Record 89
EAL Shift to Coach 90
Black Market 92

Editorials

Capt. Rickenbacker Dissents 102
Lear Sticks Out His Chin! 102

Departments

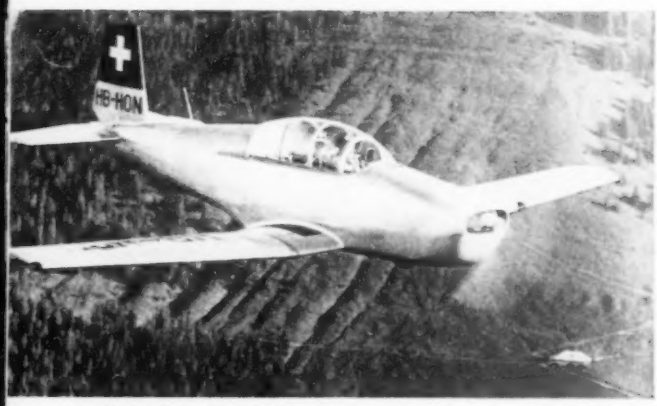
News Digest 7
Picture Page 9
Who's Where 11
Industry Observer 11
Washington Roundup 12
Thrust & Drag 41
U.S. Patents 48
Production Briefing 55
Navy Contracts 56
BuAer Contracts 56
Letters 59
Filter Center 68
What's New 76
New Aviation Products 79
Also on the Market 80
Shortlines 94
News Sidelights 100
Aviation Calendar 100

Picture Credits

7—Glenn L. Martin; 9—(center) Howard Levy; 13—BOAC; 15—Howard Levy; 16—McGraw-Hill World News; 17—Beech Aircraft Corp.; 37—Leo J. Kohn; 50-51—Ryan Aeronautical Co.; 62, 64—Hughes Aircraft Co.; 87-88—PAA; 100—Levy-Shipp.

LOCKHEED Super Connie flying laboratory with an Allison T56 turboprop engine in far left nacelle takes off from Burbank, Calif., on start of test program of T56-type powerplants to be used inLockheed C-130 cargo plane. Other three engines are piston types.

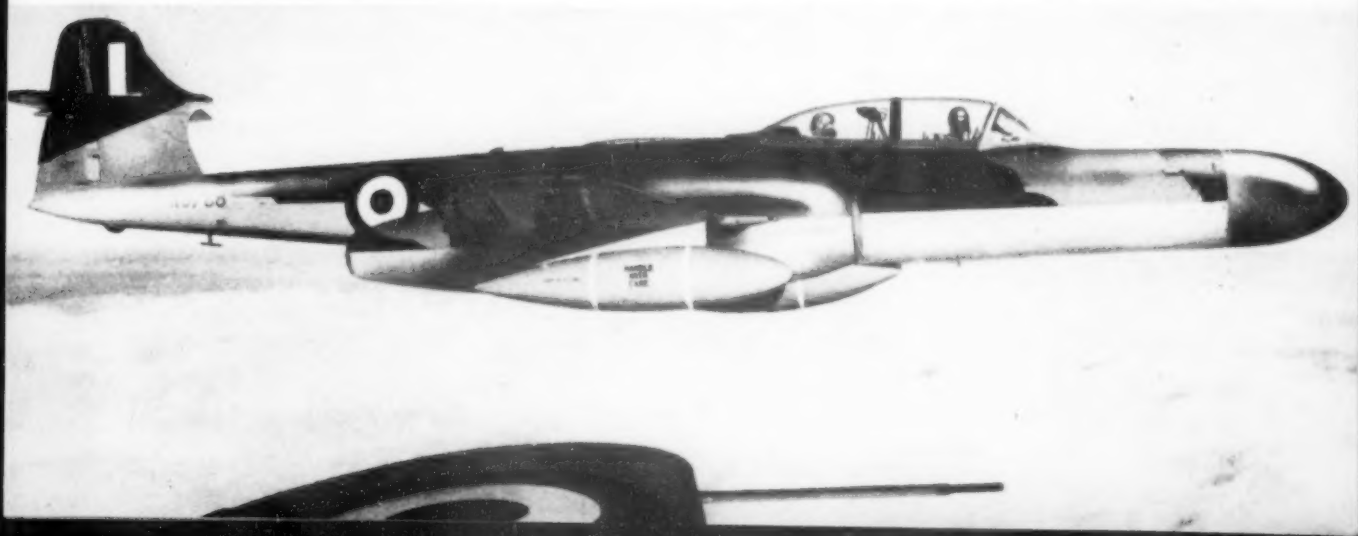
New Shapes Aloft Here and Abroad



PILATUS P-3 primary trainer is being tested by Swiss Defense Department. All-metal craft has retractable tricycle landing gear, 260-hp. Lycoming. Top speed is given as 190 mph.

STITS Playboy, cleaned up since first appearance (Aviation Week Jan. 18, p. 44), now does 150 mph. More than 25 Playboys are being built from kits in U. S., says the designer.

ARMSTRONG WHITWORTH Meteor N. F. 14 twin-jet nightfighter (below) features a cleaner canopy than earlier N. F. 11, also has modified fin with fairings in vicinity of projecting "bullet." Plane is 49 ft. 11 in. long. It has radar in nose, four cannon in wings.



24 Houris...1 Hostage

One by one, the veiled women boarded the plane, bound for the old world after a glimpse of the new. The sheik was still in Washington, attending a diplomatic dinner. He would leave tomorrow — tonight, he was sending his harem home.

But not unguarded. A stout, turbaned officer shepherded them aboard, then motioned politely to the Airwork representative to precede him into the plane.

It was a special service flight for the Airwork man. He had just supervised the engine overhaul of the sheik's plane and was now making the flight to instruct the native mechanics who would care for it in Saudi Arabia.

Once inside the plane, the guard loosened the automatic in his holster significantly. As the plane took off, he observed, "If these engines sputter, you will be the first to die." His tone was matter-of-fact, yet firm. The Airwork man swallowed hard, but said nothing. What *could* he say?

The rest of the story is anticlimax. The rebuilt engines functioned perfectly — the flight was without further incident, thanks to Airwork's high standards of overhaul, ensuring factory-new performance. Airwork production line techniques are equal to those of the original manufacturer. That is the only way to get unvarying quality.

Airwork will gladly handle your overhaul and supply problems. Ask about our personalized service, the Airwork exchange, and dealer programs.

Distributors for
Pratt & Whitney Aircraft

Airwork
CORPORATION
Millville, N.J.

NEW YORK MIAMI WASHINGTON

WHO'S WHERE

In the Front Office

William H. Coleman is new president of Aero Supply Manufacturing Co., Corry, Pa.

A. M. Rochlen, public relations director for Douglas Aircraft Co., and **K. G. Farrar,** general manager of the Long Beach Division, have been elected vice presidents of the Santa Monica, Calif., firm.

Walter H. Johnson, Jr., has been appointed vice president and sales manager of American Airlines.

D. P. Renda has been elected vice president-legal of Western Air Lines.

Ford Sebastian is vice president and general manager of Williams Manufacturing Co.'s new Scalectric Division, Chicago.

L. John Eichner has been promoted by Trans-Texas Airways to vice president-traffic and sales.

G. W. Fleming has become vice president and general manager of Flight Service, Inc., Syracuse, N. Y.

Albert Steg has been elected treasurer and controller of Borg-Warner Corp., Chicago. **H. Hunter Gehlbach** is new secretary.

Harold B. Smith, president of Illinois Tool Works of Chicago, has been appointed a director of Capital Airlines.

Changes

F. Maurice McGregor, Canadian aviation pioneer, has joined Pakistan International Airlines as general manager.

David D. Coffin, manager of Raytheon Manufacturing Co.'s Missile and Radar Division at Bedford, Mass., has been appointed assistant vice president of the company.

Webster H. Wilson has been moved up by Hazeltine Electronics Corp., Little Neck, N. Y., to assistant vice president.

Edward J. Giblin has become assistant secretary of Ex-Cell-O Corp., Detroit.

Samuel M. Kinney, Jr., has been elected assistant secretary of Daystrom, Inc., Elizabeth, N. J.

Myers Cather has joined Phil D. McHugh Advertising Agency, Los Angeles, as ad executive for aviation and allied accounts.

R. R. Jenner, former chief radio and electronics engineer for Beech Aircraft Corp., is new airborne products director for Minneapolis-Honeywell Regulator Co.'s Micro Switch Division, Freeport, Ill.

Stannard M. Potter has been appointed supervisor of Armour Research Foundation's sound and vibration control section at the Illinois Institute of Technology, Chicago.

Honors and Elections

Brig. Gen. Joseph T. Morris (USAF Ret.), assistant vice president of United Aircraft Products, Inc., will receive an honorary degree as Doctor of Science in Military Aviation from Bowling Green State University, Bowling Green, Ohio, June 4.

Frazier S. Wilson, insurance manager for United Air Lines, since 1943, has been elected president of the Midwest Insurance Buyers Assn.

INDUSTRY OBSERVER

► USAF is studying the possibility of air-launching high-altitude rockets to carry 40-lb. payloads to 250,000 ft., according to Brig. Gen. Floyd B. Wood, Deputy Commander for Technical Operations of the Air Research and Development Command.

► **Sikorsky S-58 anti-submarine warfare helicopter (Aviation Week Mar. 1, p. 11) has reached a speed of 144 mph. in level flight during early flight testing. Designation of the S-52-5, powered by Turbomeca Artouste turbojet, has been changed to S-59.**

► Western Electric Co. has shipped its first K-5 radar bombing and navigation system to the Douglas Aircraft Long Beach Division for installation in the B-66B twin-jet USAF light bomber. This marks the first time Douglas has subcontracted development of a complete operational sub-system for one of its aircraft in line with the USAF weapons system development concept.

► **Lockheed plans to complete the shift of its T-33 trainer assembly line from Van Nuys to Palmdale, Calif., by mid-May (Aviation Week Apr. 26, p. 21). Last of the Van Nuys-built T-33s are scheduled to be flown to Palmdale by the end of May.**

► American Airlines recently flight-tested a Douglas DC-7 on the transcontinental nonstop route between New York and Los Angeles using an autopilot to determine if the scheduled time could be reduced. American also is studying the possibility of flush-mounted antennas to increase speed of the DC-7.

► **Piasecki H-21 helicopters are flying on a test basis following incorporation of 27 modifications ordered by USAF when the ships were grounded in February. Time absorbed by paper work is responsible for much of the delay in this program. Engineering changes for production and service helicopters were in the works for nearly a month before the company was given the green light to manufacture modification kits. The first ungrounded H-21 flew on April 5.**

► Reciprocating engines require 1.59 barrels of oil for 100 barrels of aviation gas consumed and jet engines use 0.125 barrels of oil for every 100 barrels of jet fuel burned, a USAF study shows.

► **Competition among helicopter manufacturers is bringing real benefits to the Air Force and Navy. At least one company has cut the price on future orders for a large copter 50%. Reasons: Military buyers are shunning expensive cost-plus-fixed-fee deals and prospective airline customers say bluntly the price must come down. Major cost headache: maintenance.**

► Preservation costs for major machine tools, temporarily in excess of requirements, are averaging about $200 per tool, Navy Bureau of Aeronautics reports.

► **Average cost for Navy aircraft engine overhauls, including piston and jet engines, is $39,184. Navy will overhaul 9,183 engines in fiscal 1954 and has programmed an overhaul program of 11,323 for fiscal 1955.**

► USAF removed about 1,200 aircraft from its inventory during 1953. Removal of the bulk of these aircraft was the result of salvage and survey. Others were transferred to schools for instructional purposes.

► **Air Force is seeking about $16.6 million for fiscal 1955 to buy 29 flight simulators. Cost of a B-52 simulator is $981,000. F-100 simulator costs $368,180.**

► Approximately seven years is required for the development and initial production of a fighter plane, according to Maj. Gen. O. S. Picher, USAF assistant for programming.

Washington Roundup

Aviation Advisor

Maj. Gen. Wilton B. Persons (Ret.), Deputy Assistant to the President, is emerging as a White House expert on aviation matters. He is being relied upon increasingly by President Eisenhower for advice on aviation. An Army general, he was graduated from the Air Corps Tactical School in 1939. A brother, Brig. Gen. John W. Persons, is assigned as Air Force Deputy Director of Personnel Processing and Training at the Pentagon.

Pacific Spotlight

The Administration is looking increasingly toward the Pacific theater in defense planning. This year's foreign aid program earmarks $160 million for aircraft for this theater, compared with only $22 million last year.

Defense Department comptroller, Assistant Secretary W. J. McNeil, will be in the Far East studying the situation until July, when he returns to draw up the fiscal 1956 defense budget. McNeil was assigned by Defense Secretary Charles Wilson to accompany Gen. James Van Fleet (USA Ret.), who is surveying the Pacific situation as personal representative of the President with ambassador rank.

Regulation Change?

Indications are Civil Aeronautics Board may attempt to amend domestic Civil Air Regulations to permit 12-hr. flight-time limits for single airline crews as permitted in the international CAR.

Move stems from American Airline's difficulty in keeping within the present eight-hour limit on its westbound nonstop Douglas DC-7 coast-to-coast flights. CAA Administrator Fred B. Lee has given American until July 1 (Aviation Week Apr. 26, p. 18) to prove it can operate the flight in the scheduled 7 hr., 55 min., 50% of the time.

Look for Air Line Pilots Assn. to request a public hearing should CAB seek to amend the domestic regulations.

ATA Wins Fight

Air Transport Assn. has won its battle to obtain extended hangar leases at Washington National Airport. Present leases expire May 15. Originally, CAA Administrator Fred B. Lee wanted to lease facilities on a month-to-month basis (Aviation Week May 3, p. 80) in view of the proposed legislation to incorporate the airport.

Airlines balked at such a move and Lee reversed his original plan. Renegotiations to draw up individual three-year leases between the airlines involved and CAA began last week. Chief difference in the new leases is expected to be higher rental rates. If the airport is incorporated, these leases will be assumed by the corporation.

Air Review Completed

White House staff is reviewing the Air Coordinating Committee's aviation policy review in its broad aspects, with Budget Bureau handling the details. The review, in preparation since last September, was handed to the White House a day ahead of the May 1 deadline. A confidential supplement on unresolved problems may be sent to the President later.

Navy Information Reshuffle

New Navy information lineup brings in Rear Adm. William G. Beecher as Navy chief of information in July, replacing Rear Adm. Lewis S. Parks who is being assigned to command the Norfolk Naval Base after a two-year tour as information chief. Adm. Beecher, a submarine officer, served as assistant director of Navy public relations for two years during World War II. He later commanded a mine division in the Pacific. His present assignment is commander of the Middle East force in the Persian Gulf.

Other information changes:

Capt. Gordon Selby, also a submariner, replaces Cmdr. Slade Cutter as director of Navy public information. Capt. Selby now is attending the Industrial College of the Armed Forces and commanded a submarine in the Pacific during World War II. Cmdr. Cutter will join the Atlantic Fleet submarine force.

Cmdr. William E. Gaillard, Naval aviator now assigned in Hawaii, will take over as director of field liaison from Capt. Louis Kirn.

Capt. Richard Lane, of the 12th Naval District staff, San Francisco, will become director of the civil relations division, replacing Capt. James Weiler.

CAA Study

Commerce Department now expects to receive the $104,500 management study being made of CAA by Cresap, McCormick and Paget, a New York firm, by May 15 (Aviation Week May 3, p. 18). Sen. Pat McCarran has labeled the study "a complete waste of funds" and some members of the Senate Appropriations Committee are skeptical of the usefulness of such a study.

USAF Academy

Observers saw further indications of Air Force efforts to direct its construction program (Aviation Week Apr. 12, p. 12) as Secretary Talbott said that he would select an architectural-engineering firm to produce a design for the new academy.

The Air Academy Act, which provides $125 million for land acquisition, planning, design and construction, authorizes the Secretary to perform the work by contract or otherwise, as he deems necessary or desirable.

USAF base construction is handled by the Army Corps of Engineers and usual procedure is to have designs prepared under Army Engineer supervision. An academy project office under the USAF Assistant Chief of Staff for Installations will gather information on firms desiring to be considered for the work.

Indo-China Switch

Eisenhower Administration, which was on the verge of armed intervention with U.S. forces in Indo-China only a few weeks ago, now is veering away from committing actual troops to that conflict.

Top Administration leaders, including Defense Secretary Charles E. Wilson, last week were emphasizing publicly that U.S. policy was to furnish the French union forces all aid short of actual military forces. Meanwhile, USAF troop carrier C-124s were preparing another long-range airlift of French troops from Europe and North Africa to the embattled garrison at Dien Bien Phu.

—Washington staff

AVIATION WEEK

VOL. 60, NO. 19

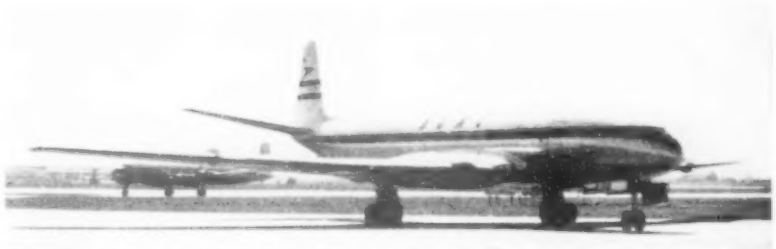
MAY 10, 1954

Comet Debacle Stuns British Aviation

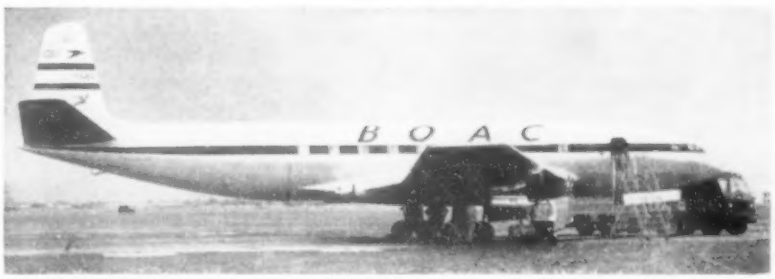
U.K.'s Best Bet Becomes Its Big Liability

- **BOAC, de Havilland face major fiscal problems.**
- **Impact of jet transport crashes could hit U. S.**

By Seabrook Hull
(McGraw-Hill World News)



LAST BOAC COMET to come home following grounding order taxies into London Airport.



GROUNDED COMET awaits fate at London Airport as investigators probe crash causes.

London—Nearly all new airliners have their starting troubles, but ask any Britisher today and he'll say the Comet is having a lot more than its just share of bad luck.

These troubles go far beyond the more or less routine problem of finding out why Comet 1, the world's first commercial jet airliner, suddenly has developed a tendency to disintegrate. They not only are the cause of major shifts and reappraisals in British aviation—by both producers and operators—but could have a considerable impact in the U. S. and on jet propulsion in general.

▶ **No Hint**—Today, nearly a month after the Stromboli crash and more than three months after the Elba disaster, investigators still have not the slightest hint of the cause (or causes).

There is a general consensus that the same thing and one thing only—not a combination of two or more—set off both crashes and also may have been responsible for the Calcutta accident.

Meanwhile, the Comet, once British aviation's greatest prestige builder, now is its greatest liability. Its airworthiness certificate has been withdrawn (AVIATION WEEK Apr. 19, p. 14), and:

• **British Overseas Airways Corp.,** which had built its future around the Comet 2 and 3, is furiously reappraising its equipment needs, fears it may have to buy more U. S. or Canadian equipment to fill the gaps left by the grounding of its six remaining Series 1s and the inevitable delay in delivery of the 12 Comet 2s on order.

• **The de Havilland Aircraft Co.,** designers and manufacturers of the ill-fated aircraft, does not know where to turn next. With 26 Comet 2s in various stages of completion, all work has been halted except on two nearing the flight test stage. Untold millions of dollars in operating capital face a most uncertain future. It is possible that if the crash causes are not found and remedied soon, the company will be in serious financial trouble.

• **Other British producers,** like Vickers-Armstrongs with its V-1000 jet transport, cannot but wonder what all this means to them.

Adding further to de Havilland's troubles is the decided possibility that some orders for Comet 2s may be canceled.

▶ **New Phenomenon?**—There may be a basic lesson to be learned in jet aviation in general, when (and if) the crash causes are determined. Inevitably, these events give new impetus to disputants who argue for and against external pod mounts for the engines.

But the reasons may go deeper than that. The Comet 1 is unique in at least one respect. In two and a half years of operation, British sources say it has logged more hours per aircraft than probably any other class of jets in operation—some 3,500 hr. per aircraft. Thus, the possibility seriously is raised that whatever caused the two Rome accidents may be basic to jet aviation—some new phenomenon that comes to light only after a great many hours of actual inflight operation.

▶ **Filling the Gap**—BOAC is not sure it can put out vast sums of money for new piston-type aircraft and still hold its Comet buying schedule intact. Its active fleet now—22 Argonauts, 11 Constellations, 10 Stratocruisers and six Comet 1s—cannot meet current route commitments with the Comets down, even after switching some Argonauts away from the South American run.

Thus, it appears virtually certain BOAC will have to buy or lease additional equipment, not only to replace the Comet 1s but to fill the gap left by Comet 2s scheduled to be delivered this year. Some estimates are that it would require twice as many non-jets.

Efforts are being made to speed up

707 Flight: June

Boeing's prototype 707 Stratoliner jet tanker-transport now is expected to fly in June—two months ahead of schedule—company president William M. Allen has told stockholders. Rollout of the jet Stratoliner, which will have an unusual paint scheme, according to a source inside the company, will be this month.

Reds Reveal New Jet Bomber

Positive proof that the Russians have built a long-range jet bomber was provided by the Soviets at their annual May Day aerial display over Moscow.

The Russians publicly displayed for the first time a large sweptwing bomber powered by four turbojets. American correspondents in Moscow who watched the huge bomber sweep over Red Square at low altitude described it as roughly similar to the Boeing B-52 in size and shape.

The big bomber led the aerial fly-by of approximately 175 Russian jet-powered planes that included a squadron-sized formation of new twin-jet bomber types, a formation of sweptwing Il-28-2s (AVIATION WEEK Jan. 11, p. 14) and a variety of fighter types, some of which were publicly displayed for the first time. AVIATION WEEK reported on Russian long-range jet bomber development Feb. 15 (p. 12) and Mar. 15 (p. 90).

production of the 26 Bristol Britannias BOAC expects to receive next year. However, there is little likelihood these will be delivered in time to make up the deficiency. The Britannia with Bristol 705 turboprop engines is underpowered, and the company is reported to be having some trouble fitting in larger Bristol 750s. The airline will be lucky if it gets four aircraft delivered for training purposes by year-end, as scheduled.

► **Routes Suffer**—Meanwhile, BOAC's routes to Johannesburg, Australia and Tokyo are suffering. It has dropped its South American run entirely.

South African Airways now is running nearly twice as many flights over the Johannesburg-London route as the British line was able to do. Before, the two companies used to run one for one.

Both Scandinavian Airlines System and KLM Royal Dutch Airlines are putting the pressure on South Africa to ease restrictions on their operation, scheduled to go into effect July 1. They well may make their point. None of this helps BOAC.

Negotiations are going on with Qantas Empire Airways to see if BOAC-Qantas schedules can be readjusted to take care of the Far Eastern services with equipment on hand.

BOAC hopes to show better than $2.8-million profit (after interest payments) for the financial year just ending. The way things are going now, it is not likely to do anywhere nearly as well in 1955.

► **DH Dilemma**—The de Havilland dilemma is greater even than BOAC's. DH will not say what it cost to set up Comet 2 production, but it generally is conceded the company's stock issue last year went entirely to finance this line. This would mean there is at least $15 million tied up in Series 2 production. The actual total could be much higher. Comet 2s sell for $1.5 million each, and there are 26 in advanced stages of construction.

Actually, DH is in something of a spot. It cannot abandon the Comet project; there is too much at stake. There is no ready-made alternative use for the facilities; and, sooner or later, the trouble should be found.

Work has been accelerated on the Venom and other military orders, but it cannot come anywhere near replacing idle Comet lines. The gloom that has settled over de Havilland's top management probably is unprecedented in aviation history.

► **Design Questioned**—But that is not the end of their troubles. Monday-morning quarterbacking has given rise to considerable discussion of the Comet in general and DH's design methods.

For example, the recent wing modifications on the Comet 2 (AVIATION WEEK Dec. 7, p. 13). This plane originally was fitted with the same wing as that on the Comet 1, a symmetrical airfoil design for something on the order of Mach 0.8. The plane does not go that fast, thus, the wing was not necessary, particularly since it resulted in undesirable lowspeed stalling characteristics that limited takeoff angle of incidence to between 5 and 11.5 deg.

The modification, which was to add about three inches more camber to the lower leading edge, widened these limits and apparently did not reduce top speed performance at all.

The point is made that the wing never should have been put on the aircraft in the first place. This is not cited as a possible cause for the Rome accidents, although wing characteristics along with pilot error were blamed for the loss of a Canadian Pacific Airlines Comet 1 on takeoff in Karachi. It is cited as an example of bad design by some critics.

► **Competitors' Chance**—The blow to the Comet's reputation and the delay in its development gives other potential competitors a much better chance. No one has anything on the way to compete with the Comet 2, except Boeing's 707.

But Vickers V-1000 is touted by its makers as a hot contender in markets for which the Comet 3 and the hypothetical Series 4 are intended.

A. V. Roe's briefly-dreamed-of passenger version of the delta-wing Vulcan bomber, the Avro Atlantic, remains only that—a brief and abandoned dream.

► **Combined Efforts**—The whole future of the Comet—thus, a major share of BOAC's prestige and the financial health of de Havilland—rests on determining conclusively what caused the Elba and Stromboli crashes. Towards this end, no fewer than five major groups are bending their efforts: the Royal Aeronautical Establishment at Farnborough, the Air Registration Board, Ministry of Civil Aviation's Accident Branch, de Havilland and BOAC.

At Farnborough, RAE has been fatigue testing the Comet 1 since last fall. This plane now has flown more than 15,000 hr. on the test bed without experiencing a single major structural failure.

A second Comet has been brought to Farnborough. This aircraft, one of BOAC's 3,500-hr. operational aircraft is being subjected to minute inspection by one team of experts after another, delving into every phase of the aircraft—design, construction, airframe, wings, tail, fuselage, fuel tanks, control systems, radio gear, engine mounts, engines, hydraulic systems, pressurizing, etc. This alone will take weeks.

Meanwhile, another BOAC Comet soon is to be turned over to RAE for flight testing.

Similarly, de Havilland has two BOAC Comets at Hatfield. One has been torn down into little bits and pieces. Each is being given a searching inspection.

All the parts recovered from the Elba wreckage are now in England, about 75% of the entire aircraft, including virtually all major components. A few pieces of the tail section are being fished out now. All these are being examined carefully. Similarly, the Calcutta wreck-

Comet Sub?

Strong indications that British Overseas Airways Corp. will replace its de Havilland Comet jet transports with Lockheed Constellations or Super Constellations were seen in these developments reported to AVIATION WEEK:

- Active discussions were being held with Qantas Empire Airways, Australia, concerning early purchase of three or four Qantas-owned 749 Connies, a BOAC spokesman said. Last month Qantas received the first of eight Super Connies it has ordered as 749 replacements.
- An informed West Coast industry source told AVIATION WEEK that the British carrier is interested in obtaining Super Constellations.

age is getting a thorough looking-into.

▶ **Flight Test**—Ultimately, both RAE and de Havilland feel they will have to resort to actual flight testing. "We'll have to try to bust another one up." The aircraft used for this purpose will be thoroughly instrumented and equipped with special escape hatches for the crew.

If necessary, in the final analysis, the aircraft will be taken to Rome to get exact duplication of crash conditions.

Speculation as to what caused both crashes is rampant. When asked, both RAE and DH gloomily maintain that no one has the slightest hint of the cause.

This may not be entirely true. The first piece to go in the Calcutta crash was a tail plane, the result of a terrific downward pressure on it as if the aircraft had been nosed-over violently. Preliminary examination of the Elba wreckage indicates it was subject to a terrific number of Gs, perhaps as many as 20 or 30—enough to tear the aircraft to pieces. There is every indication the Stromboli crash was just as violent.

▶ **Speculation**—The search, nevertheless, is extremely difficult. Each time, after Calcutta and after Elba, the Comet 1 was given a most thorough checking, and in each case it was possible to tell how the aircraft broke apart but, in neither case, why.

There is a tendency to rule out simple structural failure caused by fatigue. "This would have shown up before this." For similar reasons there also is a tendency to rule out engine failure.

Most observers are convinced the Elba and Stromboli crashes were caused by the same thing. The cause also may explain the Calcutta disaster, although this one could have been weather.

A further general conclusion is that it is a single failure that caused the crashes. Various speculation holds the aircraft was ripped apart by:

• **Jet streams at high altitudes.** This could explain the two Rome crashes but not the Calcutta disaster, because the latter plane fell apart at too low an altitude.

• **Fuel tanks.** Under just the right conditions, the vapor pressure of jet fuels in a partially filled or empty tank can be raised to the flash point. There is an inclination to discount this as a possibility, however, since it would take a combination of circumstances: (1) Mixture would have to become explosive and (2) a spark would have to be introduced to set it off.

• **Power control system.** The Comet's controls have been the subject of much comment: "The pilot doesn't have any feel; doesn't know if he's overcontrolling; might, in an emergency, have to spend too much time switching from a failed system to one that was operative."

• **Explosion of accumulation of hydraulic fluid vapor.** Again, this is theoretically possible under just the right conditions.

• **Ultra-sonic vibrations from turbine blades.** Little is known of the effect on materials of continuous and prolonged bombardment by these waves. This possibility is being explored thoroughly. It fits the theory that whatever is the matter, it well may be related to the long inflight hours the Comet has logged.

The point is: If it is something of a basic nature that is behind the Comet's troubles, it will affect not only British aviation, but jet developments in general the world over, including the Boeing 707 and the wide range of military aircraft now in operation and on the drawing boards.

Meanwhile, the Comet is grounded ignominiously—a sad commentary on a great experiment—and British aeronautical prestige appears to be pinned on the ability of a now-unknown technician coming up with the answer to the question: "Why do Comets blow up?"

Boundary-Layer Control for Jets

Navy Tests New Unit on Panther

By Claude O. Witze

Carrier-based jet fighter planes easily can be converted into attack aircraft and solve a major Navy Aviation problem if operational tests now being conducted with a modified F9F-4 Panther prove successful. A new application of boundary-layer control called "super circulation" gets credit for the improved performance.

Super-circulation is a system of bleeding air from the centrifugal compressor of the Panther's Allison J33 engine through a duct in the wing and forcing it out at high speed over the trailing edge. By this process, Bureau of Aeronautics engineers say, the Grumman-built fighter can carry 3,000 lb. more external armament and land 20 knots slower than normal.

▶ **For Smaller Carriers**—If the tests now under way on the USS Bennington provide operational proof of this boundary-layer control system's efficiency, the Navy may have a solution to one of its most pressing operational problems—the lack of a jet-powered, carrier-based attack plane.

Current standard operational carrier attack plane is the Douglas AD Skyraider powered by a Wright R3350 piston engine. Navy's first jet-powered attack plane is the Douglas A3D powered by two Pratt & Whitney Aircraft J57s, but it was designed for use only aboard the Midway- and Forrestal-class supercarriers and still is many months away from fleet use.

If the Navy quickly can convert its current inventory of Grumman Panthers and Cougars and McDonnell Banshee jet fighters to attack planes by using this new system, it will prolong the service life of these types of aircraft and provide a large fleet of jet-powered attack planes that can operate from Essex-class carriers as well as the larger Midway- and Forrestal-class carriers.

▶ **Several Projects**—A number of boundary-layer control research projects are known to be under way involving either the sucking or blowing of air over airplane wings. Both the National Advisory Committee for Aeronautics and aircraft manufacturers are studying proposals to improve performance by this technique.

Highspeed blasting of air over the trailing edge of the wing tends to reduce

Spanish Develop New Trainer

First view of the new Asai I-11B light trainer developed in Spain for flying clubs and private pilots. Approximately 70 of the planes are being produced. Sales price is estimated at $3,500. Powered by a 90-hp. Continental, the I-11B has a top speed of approximately 125 mph. and a range of some 400 mi. Wingspan is about 30 ft. 6 in. Landing gear is fixed. An earlier model developed by Aisa, Madrid, the I-11, was similar but incorporated tricycle landing gear. Both models are built of wood.

turbulence in that area by making the normal flow of boundary-layer air hug the wing even at slow or near-stalling speeds. Slow landing speeds are of particular importance in carrier operations, which explains the Navy's intense interest in the program. BuAer says the super-circulation technique can be applied to most jet planes.

Ordinarily, the extra lift provided by the super-circulation system would be used only for takeoff and landing and not during flight or combat. However, the system is controlled by the pilot and can be used during flight if additional lift is required.

▶**Cessna Tested**—Installation of the system on the Panther followed extensive testing of the basic idea on a Cessna 170 lightplane at Anacostia (D. C.) Naval Air Station. The Cessna was chosen for this project because it lends itself to easy modification.

Improved and applied to the F9F-4, BuAer says the device will permit a range of 688 nautical miles with the increased weight. In addition, the fighter, because of slower landing speed, will be able to operate from carriers equipped with the H4-1 catapult and Mk.-4 arresting gear. Despite increase of gross weight to 22,000 lb., the standard Panther can use the catapult at a gross of only 15,962 lb. and must land with Mk.-5 gear, larger than the Mk.-4, with only 10% of fuel aboard.

Urging intensive research on super-circulation, BuAer has recommended that more windtunnel tests be made and that engine manufacturers explore new methods of bleeding air from jet engines for use in boundary-layer control.

▶**German Research**—The Navy started its research on super-circulation with a system proposed by the Arado Aircraft Co. of Germany. An early German version had been installed on an ME-109.

Arado's device consisted of an air pump in the wing that sucked in air over the flap and blew it out at a higher speed over the aileron. In the original plans, hydrogen peroxide was to be used for fuel.

Adapting this to the Cessna 170, the Navy replaced the peroxide engine with a small AiResearch turbine. Since then, Wyandotte Chemical Co. and Reaction Motors, Inc., have been given contracts to develop pumps driven by ethylene oxide.

Basic difficulty with the Arado system was that it required a separate pump and fuel to operate it. This limited operation of the device to relatively short periods and led to a study of the possibility of diverting some of the jet engine blast for super-circulation.

Navy says John S. Attinello, BuAer engineer who perfected the system, has been cited for his work on this "especially significant technological advancement in Naval Aviation."

Attinello has received the Navy's Meritorious Civilian Service Award from Rear Adm. Apollo Soucek, BuAer chief.

Japs Test New Convertiplane

Tied down for preliminary tests, the new Kayaba Heliplane has a Continental 185-hp. engine in the nose for highspeed forward flight; for takeoff and landing, it uses ramjets fitted to the tips of the three-blade, 36-ft. diameter rotor. Ishikawajima units of approximately 45 lb. thrust each are among the many ramjet powerplants being tried. Rotor also is connected to the Continental engine. Design top speed is approximately 105 mph., and range is about 250 mi. The stub wings span approximately 10.5 ft. Shiro Kayaba, vice president of Kayaba Industrial Co., Tokyo, began the Heliplane design during World War II. Construction began early in 1953.

Airpower Cuts

- **House trims Air Force, Naval Aviation budgets.**
- **But fiscal '55 reductions face stiff Senate fight.**

With few words of protest, the House passed trimmed Air Force and Naval Aviation budgets for fiscal 1955 to implement the Administration's "new look" defense program.

The House voted $10.8 billion in new money for Air Force, more than $380 million under the $11.2 billion recommended by the Administration. It also was substantially below the $11.4 billion approved for the current fiscal year.

Naval Aviation received $2.9 billion, $17 million less than recommended by the Administration but substantially higher than this year's allocation of $2.3 billion.

The only change in airpower funds made in the recommendations of the Appropriations Committee (AVIATION WEEK May 3, p. 16) was to strike out a ceiling of 100 hr. a year on extra pay for proficiency flying on a 95-to-63 standing vote.

▶**Senate Opposition**—The Air Force budget, however, is faced with opposition in the Senate as "too little, too late." Several senators have been vocally critical of the Administration for putting off the achievement of a 137-wing force until 1957.

Senate Military Appropriations Subcommittee, headed by Sen. Homer Ferguson, will start hearings on the defense money bill this week.

▶**'Super Salesmen'**—In a speech in Detroit, home of Ferguson and Defense Secretary Charles E. Wilson, former Air Force Secretary Sen. Stuart Symington pointed to the Administration's slash of $5 billion last year in new money for USAF, and commented:

"This year their super salesmen went to work—in the press, on radio, and above all, on television. They ballyhooed the idea that this year great emphasis would be on airpower.

"How many citizens know that, despite that ballyhoo, today the Republican Administration is recommending fewer planes and fewer trained people for the Air Force than it did last year—and this after the previous $5-billion cut.

"This country today is relatively weaker—relatively is the important word—against the military might of Soviet Russia, than it has ever been against any possible enemy in the history of our country."

▶**Floor Debate**—Highlights of the two-

day debate on the defense bill on the House floor were:

• **Rep. George Mahon,** ranking Democrat on the Military Appropriations Subcommittee, generally endorsed the Administration's program, but expressed some apprehension of a cut of $21.5 million in the Administration's request of $431 million for USAF research and development. The $409 million approved by the House is substantially below the $440 million in new money voted for this year.

"This philosophy behind this bill is that it is not for today or for tomorrow, but for the long haul of a period of years," Mahon said. "Based upon that philosophy it can be defended."

• **Rep. Mel Price,** pointing out that the Administration cut USAF procurement funds from $6.7 billion to $3.5 billion for fiscal 1954 and that the amount proposed for fiscal 1955 is only $2.7 billion, commented:

"This category was cut so drastically last year that I cannot foresee anyone's having the temerity to reduce funds for aircraft procurement this year."

• **Rep. Harold Patten,** a World War II Air Corps officer, observed: "This year the Administration was supposedly airpower minded. In his budget message, the President told us that the fiscal 1955 budget points toward the . . . exploitation of modern airpower . . . . But even favorably disposed as it is this year to the Air Force, the Administration has asked for only $11.2 billion—less than was appropriated last year."

Bill Adds New Basis For Contract Reviews

Legislation liberalizing the grounds for judicial review of disputes arising from government contracts has been sent to the White House for the President's signature.

The legislation was necessitated by a Supreme Court decision holding fraud as the only ground under which a contractor could seek judicial settlement of a dispute.

It provides for review if a decision is "capricious or arbitrary or so grossly erroneous as necessarily to imply bad faith or is not supported by substantial evidence." The measure also prohibits the insertion in government contracts of provisions making the decisions of government officers final on questions of law arising under contracts.

Merger Approved

Merger of Convair into General Dynamics Corp. was approved by stockholders of both companies at a special meeting in Dover, Del. (AVIATION WEEK Apr. 19, p. 17).

Present Copters Inadequate: Army

Military to toss headaches in design, maintenance costs and supply difficulties to manufacturers.

There are factors "tending to defeat the use of the helicopter in its military mission of combat and logistical support," the U. S. Army says, and this week the entire problem will be dropped in the lap of industry at a three-day meeting in St. Louis.

"Inadequate design, high cost of maintenance and difficulties of supply" are major stumbling blocks to wider and more efficient use of the helicopter as a flying truck, says Col. William B. Bunker, assistant chief of transportation for Army aviation. Approximately 400 industry representatives are expected to be present at the Army's first helicopter symposium.

▶ **Army Views**—"It is our purpose," Col. Bunker told AVIATION WEEK, "to explain this problem and make it clear why we feel it is a problem. All of these things are matters about which we have written many reports. The industry has had other problems to solve and they have felt that such things as design improvements, maintenance cost and supply would be solved at a later date.

"Now we want to emphasize the importance of the program to the industry. We feel that the later date has now arrived.

"The helicopter is of age and the time has now come when we must examine where we stand and what we should do. We can no longer live with the fact that it costs more to maintain a helicopter than it does to own one," Col. Bunker said.

▶ **Shortcomings**—The Army's experiences in Korea, generally credited with having lifted the copter industry from infancy to a major position in the nation's aircraft picture, uncovered many faults as well as advantages to rotary-wing operations.

In a report based on the Korean war (AVIATION WEEK Mar. 22, p. 25), major shortcomings listed were small single-lift capacity, high maintenance requirements, complexity and low service life of components.

"In effect," the Army said, "the desirable machine should be a simple, rugged, reliable and easy-to-maintain piece of military equipment."

▶ **Improving the Product**—Col. Bunker has been encouraging the helicopter industry to improve their product for the past several years.

To support his case at the St. Louis meeting this week, he has lined up a list of Army experts to tell industry representatives about their experiences and seek a mutually agreeable program to solve some of the problems. They will include:

• **Lt. Col. Karl H. Zornig,** chief of the Army Aviation Division's training branch, who will discuss the capabilities, mission and operating conditions of Army aircraft maintenance units and tools.

• **Lt. Col. E. C. Holland** of the Army

Japs Get First Beech Trainers

Two Beech-built T-34 Mentor military trainers in the air with Japanese insignia during formal acceptance ceremonies conducted at Utsunomiya Airport near Tokyo. The planes are for Japan's National Safety Forces. A large quantity of T-34s will be built for NSF under a joint program that schedules production both by Beech Aircraft Corp. at Wichita, and Fuji Heavy Industries, Tokyo, under license-contract.

Transportation Corps aviation field service office, who will discuss the importance of increased service life and how it can be used to cut costs.

• **Capt. Marion G. Corneill,** commander of a helicopter maintenance company at Ft. Sill, Okla., will tell about the difficulties experienced in the field and make maintenance design recommendations.

• **Donald M. Thompson,** chief of engineering and development branch for the Transportation Corps' Air Transport Service, will demonstrate that the most important feature of a helicopter is availability and more emphasis should be given to this than to speed or increased payload.

▶ **Industry Studies**—The helicopter industry, represented by accessory and parts manufacturers as well as major rotary-wing producers, also will participate in the proceedings at the St. Louis meeting.

Some of the speakers and their subjects:

• William Wiseman, chief engineer of Continental Motors Corp., will present a study of low-power and high-power operation on the life of the engine.

• Dr. Arthur Nutt, Lycoming-Spencer, will speak on "Matching Powerplants to Helicopters."

• Warren T. Colwell, Gleason Gear Manufacturing Co., and S. W. Baker, of Burgen Engineering Corp., will speak on transmission problems.

• Harland S. Hostler, Parsons Aircraft Corp.; H. W. Bonnett, Sikorsky; Robert L. Lichten, Bell Aircraft, and a representative of Prewitt Aircraft Co. are scheduled to speak on rotor blade problems.

• Richard Carlson, of Hiller Helicopter Co., will discuss the design of transmissions for 1,000-hr. life.

• Frank N. Piasecki, board chairman of Piasecki Helicopter Corp., will deliver a paper on the "Design of a Complete Helicopter to Have a Service Life of 1,000 Hr. Between Overhaul."

• Jack Gallagher, chief engineer and operations manager of New York Airways, is scheduled to address a dinner meeting on the experience of his company with maintenance of the Sikorsky S-55 in commercial service.

The symposium will open with talks by Maj. Gen. Paul F. Yount, Army chief of transportation, and Brig. Gen. A. T. McNamara, chief of the Supply Division, G-4 (logistics).

Among companies invited to send representatives to the St. Louis meeting: Sikorsky, Bell, Piasecki, Kaiser Metal Products, Bendix, Cessna, Aeronca, Doman, American Helicopter, Douglas, Aviation Corporation of Texas, Fairchild, American Car & Foundry, Lockheed, Goodyear, Bellanca, Piper, Hughes, Jacobs, Kellett, Ryan and de Havilland.

Aircraft Workforce

Employment in the aircraft industry was 770,600 in January 1954, an increase of 49,200 from the same month last year, a Labor Department study shows.

Number of production workers was 559,500 in January 1954, compared with 530,700 for January 1953.

The breakdown:

	(In thousands) Jan. 1954	Jan. 1953
Industry group		
Aircraft	466.5	447.8
Aircraft engines and parts	166.6	158.1
Aircraft propellers and parts	16.5	16.3
Other aircraft Parts, equipment	121.0	99.2

Nike Batteries

- **First of 40 installations is started in Washington.**
- **Air cover spreads over area estimated at 25 mi.**

The first of about 40 Nike antiaircraft missile launching sites is being constructed now in the Washington, D. C., area and is scheduled to become operational this summer.

Fourteen critical defense areas currently are listed to get Nike defense: Norfolk, Va.; Washington-Baltimore; Philadelphia; New York; Boston; Pittsburgh; Cleveland; Chicago-Detroit; Colorado Springs-Denver; Hanford, Wash.; Seattle; Los Angeles; San Francisco, and one unnamed site.

West Coast sources report Army has announced Los Angeles will get the second Nike installation, with preparation of launching sites already under way.

All sites are to be constructed within the next two years under a program holding priority over all other Army construction, except that allotted to certain critical ammunition manufacturing projects.

▶ **Battery Details**—Nike is a surface-to-air missile developed by Bell Telephone and Douglas Aircraft, currently being built by Douglas under an Army Ordnance contract (AVIATION WEEK Mar. 15, p. 78). Rocket-propelled and supersonic, Nike has a slant range of about 18 mi.

Several sites will be located around Washington to provide an air cover estimated at 25 mi. diameter and 60,000 ft. high.

Two major areas, separated by at least 1,000 yd. but no more than four miles, make up a single Nike site. The launching area contains everything necessary to assemble, test, fuel, store and launch the missiles; the control area contains all the radars and power equipment.

Underground magazines contain missile storage space and firing controls. Missiles are moved out of the magazine in a horizontal position on a special launcher. They are raised to the surface by an elevator while simultaneously being erected to the vertical for firing. At the surface, the Nike either can be fired immediately from the elevator platform or moved to launching racks which extend from either side of the elevator position.

▶ **Typical Site**—A launching area is roughly T-shaped and measures about 500 ft. along each side. Along the top of the T are the missile assembly, test buildings and fueling areas.

Two launchers are located on the upright of the T.

The control area is built around three radars for acquisition, target tracking and missile tracking. Power supply, spare parts and such extra equipment are located at this site.

Judging by the layout of the launching area, missile components are delivered by truck to the assembly and test building. There apparently is a static firing pit as part of this building for a preflight check of the acid-gasoline motor of the Nike.

Nearby is the fueling point for the missile, and further on behind earth barricades is the acid loading station.

After fueling, Nikes are wheeled to the elevators on special dollies and stored in the underground magazines.

Two launchers comprise a single Nike battery; total personnel strength required is 448 officers and enlisted men per battery. Current plans are to vary the number of batteries assigned to a given defense area in accordance with the manufacturing and population density at the site. Maximum number of batteries to any area will be four, which means only eight launchers; if conditions demand it, each battery can be expanded to handle six launchers each instead of the normal two.

'Soapbox' Back

With this issue, Engineering Forum reappears in AVIATION WEEK. Originally a sounding board for engineers' opinions, forum now has been increased in its scope to serve as a showcase for ideas of technical merit. First of the new series begins on p. 40.

Rheem

serves as a prime contractor to the United States Government . . . and as a sub-contractor to Lockheed, Northrop, Douglas, Allison, Ford, and Westinghouse — leaders in the world of aviation.

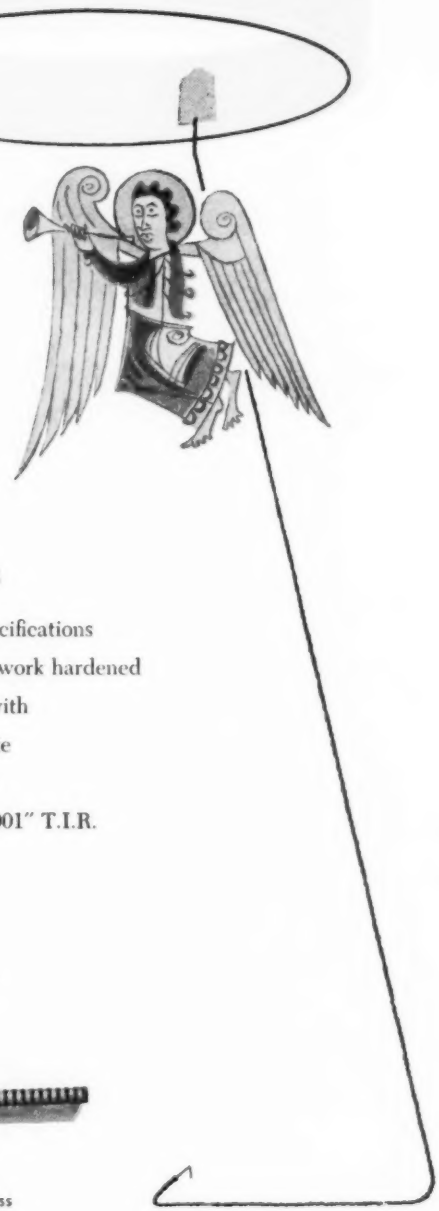
Rheem

AIRCRAFT DIVISION

RHEEM Manufacturing Company . . . Aircraft Division, Downey, California

RESEARCH • DEVELOPMENT • ENGINEERING • PRODUCTION

announcing . . . a new B. J. S. I. Co. precision product line



miniature

SLIP RINGS

and COMMUTATORS

made to your specifications
from cold drawn work hardened
precious metal, with
diameters accurate
to ±.0005" and a
concentricity of .001" T.I.R.
insuring . . .
better contacts,
longer life,
. . . greater economy.

SIZES	diameters .032" and up
CROSS SECTIONS	.005" to .060" ring thickness
FINISH	4 micro inches or better
BREAKDOWN	1250 volts R.M.S. hi-pot
RING HARDNESS	70 brinell minimum
ROTATION SPEED	to over 20000 r.p.m.
RING CONSTRUCTION	silver, gold or any specified material
CONTACTS	any number, grooved or flat

May we quote on your special requirements?

BILL JACK SCIENTIFIC INSTRUMENT CO.

143 SOUTH CEDROS AVENUE • SOLANA BEACH, CALIFORNIA • TELEPHONE SKyline 5-1551

Future Pattern of Passenger Movement

Intercity Common Carriers

(Estimated 1965)

Market Group	Distance, Mi.	Revenue Passengers (Millions) Railroad	Bus	Fixed-Wing	Helicopter	Total
A and B	0-100	94	255.5	0[1]	28.8	378.3
	101-250	34.4	22.6	4.4	15.2	76.6
C	251-500	11.7	8.8	11.3	6	37.8
D	501-1,000	4.8	3	8.4	0	16.2
E	1,000-1,500	.3	1	5.3	0	6.6
	More than 1,500	.2	.4	3.1	0	3.7
Total		145.4	291.3	32.5	50[2]	519.2

[1]Negligible

[2]An additional 10,080,000 passengers probably will utilize copter transportation in the form of "shuttle" service between airports and the major business centers of respective terminal cities.

ATA Project Director Says

Airlines Face Critical Decade

The next decade will be critical for the airlines because they will approach saturation of the longhaul passenger market—their principal source of revenue, says Grahame H. Aldrich, special project director for the Air Transport Assn.'s Research Division.

During the past five years particularly, the airlines have achieved most of their traffic acceleration within the 1,000-mi.-plus longhaul market, this despite the fact that during the past three decades the proportion of common-carrier travelers moving within specified distances has remained relatively constant.

▶ **Record Growth**—This means, Aldrich reports, that the airlines have been eating into the market faster than the population has expanded. In 1953, the airlines achieved a record 72% penetration of the 7.1 million common-carrier passengers traveling more than 1,000 mi., he states.

Further growth in this field depends upon population increase and acceleration of the national income and these elements have shown a "mature rate of movement," certainly slower than the rate of gain achieved by the airlines, he notes. By 1965, Aldrich says, the airlines will achieve only "a slight gain" in longhaul traffic penetration—reaching 82%. When the airlines reach this point, they no longer will be able to capture additional longhaul common-carrier traffic at a rate comparable to the past, Aldrich says.

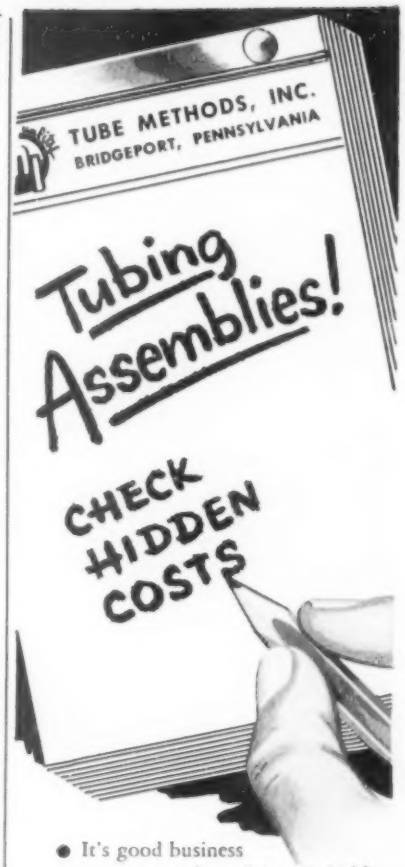
▶ **Traffic Troubles**—Noting the big gains in air travel that will be made with the use of transport helicopters, Aldrich sees a problem arising from the mixture of rotary-wing and fixed-wing operations at major airports in the U. S. In 1965, he predicts a total of 3,476,000 takeoffs involving fixed-wing and copter aircraft at these terminals with predicted

Existing Pattern of Passenger Movement

Intercity Common Carriers

(1953)

Market Group	Distance, Mi.	Revenue Passengers (Millions) Railroad	Bus	Plane	Total
A	0-50	65.3	230.9	0.1	296.3
B	51-100	55.7	36.1	0.3	92.1
	101-250	47	23.1	8.9	79
C	251-500	16	9	9.7	34.7
D	501-1,000	5.6	3	5.1	13.7
E	1,000-1,500	.4	1	3.2	4.6
	More than 1,500	.2	.4	1.9	2.5
Total		190.2	303.5	29.2	522.9



● It's good business on your part to investigate the hidden costs involved in your precision tubing assemblies. Like hidden taxes, hidden waste keeps right on robbing your profit ledger of money you have a right to earn. Check on unnecessary machining, hand-fitting, rework and salvage operations . . . rejects.

Since 1941, TMI has specialized in serving the best customers in all of America . . . with Precision Tubing worthy of the name.

We have the know-how, the special equipment, the experience to make every job a perfect job . . . producing seamless cold drawn stainless steel and alloy tubing . . . in sizes .050" to .625" O.D. to tolerances as close as .0003"

●

Next time specify TMI, one of the most respected names in the tubing field today.

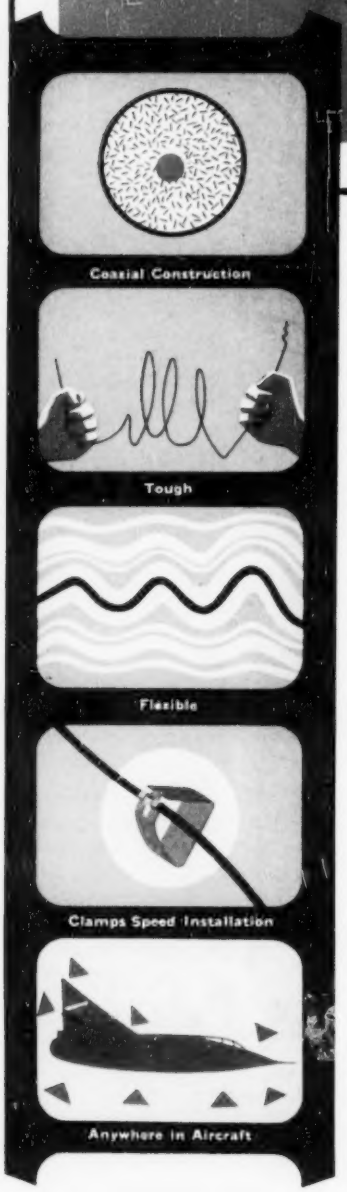
TUBE METHODS INC.

METALLURGISTS • ENGINEERS • MANUFACTURERS

BRIDGEPORT (Montgomery County), PA.

first from Edison

Continuous coaxial cable fire detection system operates from aircraft battery



Look to Edison for leadership in developing the *first* foolproof fire detection system for use anywhere in today's high-speed, high-altitude aircraft. A single flexible wire centered in thermistor material with the outer sheath acting as a ground, serves as the sensing cable. Powered by the primary battery supply, the entire system functions directly from the aircraft battery – without electronic tubes. And exclusive snap clamps speed installations – simplify maintenance. All important "firsts" from Edison, all guaranteeing maximum fire detection.

Added features from years of research in the world-famous Edison Laboratory – and years of actual experience result in the finest fire detection system ever developed.

- **Minimum weight requirements** – the control assembly tips the scale at only .8 pound; 100 feet of sensing cable, at 1 pound.
- **Low impedance design** – to eliminate completely false alarms due to moisture or capacitive effects.
- **Responds within seconds** – signals "Fire Out" automatically – and repeats indefinitely.
- **Maximum sensitivity for each zone** – because cables having varying alarm points can be series-connected in the same loop.

Won't you write us for complete data on this revolutionary development?

Thomas A Edison

A GREAT NAME
CONTINUES GREAT NEW ACHIEVEMENTS

Thomas A. Edison, Inc.
INSTRUMENT DIVISION • 49 LAKESIDE AVENUE • WEST ORANGE, NEW JERSEY

geographic distribution making the operational load a critical factor.

Nearly 42% of the projected copter flights and 41% of all fixed-wing operations will take off on land in New York, Pennsylvania, New Jersey, Delaware, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire and Maine, Aldrich estimates.

▶ **Potential Markets**—Analyzing the markets susceptible to future diversion to the airlines, Aldrich sees five groups bracketed by mileage:

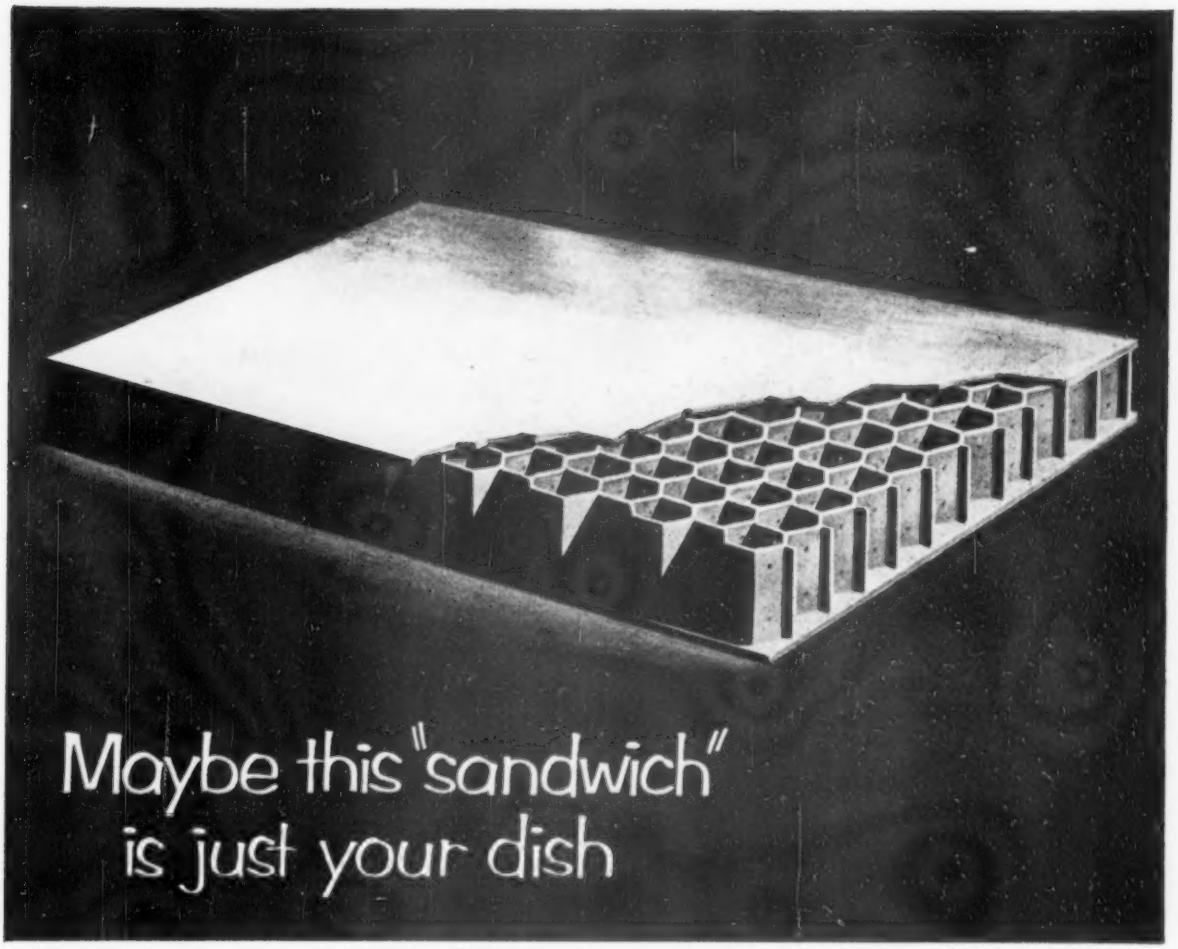
• **Group A—Less than 50 mi.** This, the largest of all common-carrier intercity markets in terms of revenue passengers, is out of the reach of airlines using present equipment and schedules. Less than 100,000 out of 296.3 million passengers in this category used air transportation last year.

• **Group B—51–250 mi.** More than 171.1 million passengers fall in this category. Last year the airlines carried five out of each 100 passengers, but nearly half this traffic moved between Washington-New York and Boston-New York.

Time advantage of air travel "is highly marginal," schedule reliability is "deficient" and the inconvenience of two

Scorpion Scores

Some tiny wisps of nylon netting, a battered rod, some cord and a radar reflector (on ground at left) are all that remain of a 6 ft. x 30 ft. tow target after a hit by rockets fired from a Northrop F-89D Scorpion on target practice. Less than a third of the normal complement of 104 2.75-in. folding-fin air-to-air rockets carried in the Scorpion's wingtip pods were fired in the pass that tore the target to bits. Examining the remains, left to right: Capt. Emerson Blair, Edwards AFB project officer; Northrop test pilot Sherman Pruitt, Jr.; Northrop flight test engineer J. Wallace and Hughes Aircraft technical representative Neale Lehman.



Maybe this "sandwich" is just your dish

THIS sandwich is a section of a lightweight structural material developed by Goodyear Aircraft Corporation.

Called *Bondolite*, it was originally pioneered for use in airships where high-strength, low-weight materials are vital.

But because of its remarkable qualities, a host of manufacturers of heavier-than-air craft have been quick to capitalize on the strength, rigidity, heat- and sound-insulational qualities of *Bondolite*—as well as benefit from the excellent weight savings it offers over conventional structural materials.

They are putting it to a wide variety of aircraft uses, such as: floor panels, partitions, bulkheads, landing gear and bomb bay doors, instrument panels, dorsal fins, trim tabs, and radar reflectors.

Because of its structural bonding by a high-strength adhesive, *Bondolite* gives fuselage sections an aerodynamically smooth surface. Since its monocoque construction permits free access and easy installation due to the absence of ribs, it is extremely well suited for leading and trailing edges.

Bondolite can be manufactured in various panel sizes and in a number of difficult double-contour shapes. A wide variety of core materials are employed, depending upon the specific needs of the customer.

Bondolite by

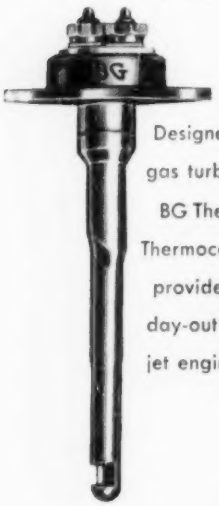
Write for *Bondolite* literature: Goodyear Aircraft Corporation, Dept. 931AQ, Akron 15, Ohio.

GOODYEAR AIRCRAFT

Bondolite—T. M. Goodyear Aircraft Corporation, Akron 15, Ohio

Plants at Akron, Ohio and Litchfield Park, Arizona

BG
IS A MUST
FOR AVIATION
TOP
PERFORMANCE



Designed especially for gas turbine application, BG Thermocouples and Thermocouple Harnesses provide steady, day-in-day-out performance on jet engines in operation the world over.

Precision-tooled and manufactured to fit *all* types of aircraft engines, BG Spark Plugs meet the most diversified operating requirements and the highest mechanical specifications.

—BG—

the name that's first with aircraft engineering and maintenance personnel.

★

For information concerning these and other BG products, write to

THE
BG
CORPORATION
136 WEST 52nd STREET • NEW YORK 19, N.Y.

limousine trips per flight is "too much effort" for most passengers, Aldrich says. But this market must be retained as an active airline potential. Helicopters will make considerable inroads here, provided heliports are established in the same general areas now occupied by major bus and train terminals.

• **Group C—Between 251–500 mi.** The air carriers can exploit a higher percentage of this market—if they improve their dependability and frequency of flights. Airlines have penetrated a "respectable" 28% of this market but could, in certain areas, get a portion of the 25 million intercity passengers who have not yet chosen to use airplanes on these distances.

• **Group D—501–1,000 mi.** This region offers a great potential for growth to the airlines. Thus far a 37% penetration has been achieved; with increased flight frequencies and the present equipment acquisition scheduled, airlines could boost this penetration to nearly 60% by 1965, Aldrich believes.

• **Group E—More than 1,000 mi.** This is the market that has meant "steak and French fries" to the airlines daily diet, but the future outlook is that growth in this field will be slight, dependent on population and income increases.

Talbott Calls USAF Planning 'Flexible'

Air Force planning for 137 wings by June 30, 1957, is based on a "floating D-Day," USAF Secretary Harold E. Talbott states in a report on the first six months of fiscal 1954.

"We are retaining a high degree of flexibility in our planning action to insure more rapid adjustments to changes in the world situation," Talbott says. "This program provides a firm base and a goal which can be reached on schedule. It also provides a force structure designed to be maintained over a long period of time."

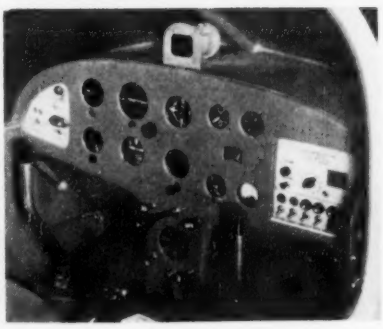
▶ **USAF Policy**—Talbott also outlines USAF industrial structure policy: "The Air Force has modified its broad industrial base policy by the issuance of a production reserve policy. This is a policy for the establishment of an industrial structure which will meet our mobilization requirement and, at the same time, give us the flexibility that the rapid technological developments in the aircraft industry demand.

"Under this policy, duplicate sources for equipment which is ahead of schedule have been phased out and, in some cases, a second source has been established in order to maintain adequate capacity for mobilization needs. Production sources are established and operating, and, accordingly, it has been possible to reduce significantly the critical lead time factor.

"The production rates contemplated will give us a better balanced program and make for an easier transition from buildup rates to replacement rates."

▶ **Increased Emphasis**—Defense Secretary Charles E. Wilson reports the fiscal 1955 budget marks the first impact of the revision of strategic plans on Defense Department's military programs.

"It places increased emphasis on the development of airpower, both Air Force and Naval, while continuing the



Italian Sportplane

First photos of new Italian Ambrosini F.7 Rondone three-place personal plane, powered by a 90-hp. Continental engine. Its tricycle landing gear is electrically retractable. Cockpit closeup (left) shows instrument layout and VHF radio installation on right side. Dual controls are fitted. Takeoff distance fully loaded is given as 492 ft. Range is 745 mi. An earlier version of the Rondone, the F.4, was of all-wood construction and seated two. A. Ambrosini & Co. is located in Milan.

Cockshutt Aircraft Ltd. produces improved jet engine parts at lower costs by Hydroforming

COMPLEX REENTRANT-SHAPED JET ENGINE PART is produced on the Cincinnati 26" Hydroform in two operations. See Figs. 1 and 2 below.

Fig. 1: **1st Hydroform Operation**

Fig. 2: **2nd Hydroform Operation**

A leading supplier of jet engine parts, Cockshutt Aircraft Ltd., Renfrew, Ontario, Canada, is obtaining many production economies by *Hydroforming* a variety of engine components that would be costly or difficult to produce by conventional methods. Two Cincinnati Hydroforms of 12" and 26" capacities are employed. The part shown in the photograph above and in Figs. 1 and 2 is typical of the work produced by Hydroforming.

Frequently Cockshutt finds it advantageous to combine Hydroforming and mechanical pressing to produce a drawn part. They report the following benefits are obtained from total Hydroforming and from combined Hydroforming-mechanical press drawing:

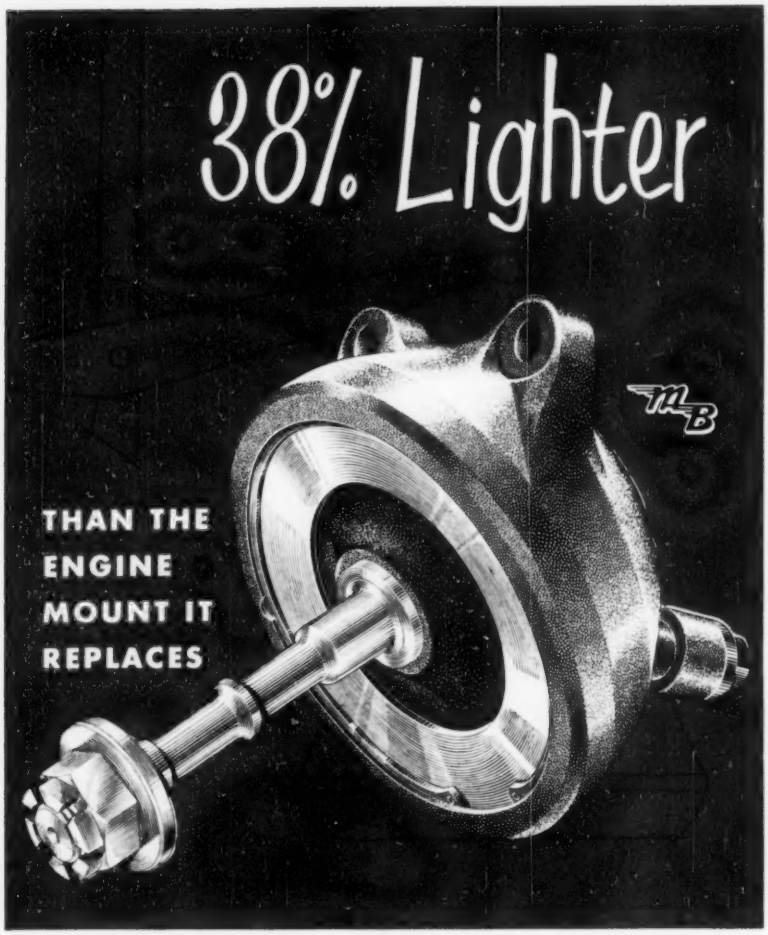
- Greatly reduced tool costs.
- Parts are produced free from wrinkles, deformation and excessive scratching.
- Part quality is improved as there is a minimum of wall and nose thin-out. The metal is displaced rather than stretched into shape.

Hydroforming offers many time- and cost-saving advantages—particularly for development work and for short runs. Let a Cincinnati Milling field engineer give you complete details. For a description of the Hydroforming process and specifications of the 8", 12", 19", 23", 26" and 32" machine sizes, write for Bulletin M-1759-3.

A 17¼" dia. blank of 0.064" Nimonic 75 is first drawn to shape shown in Fig. 1. The punch consists of two principal elements: a segmented top and a solid base for forming the shape as shown in Fig. 2. The top, segmented section of the punch is shown at right on the table in the photograph above. Completed part and 1st operation shell are also shown. An annealing operation is used between the 1st and 2nd draws to reduce the grain size. To achieve additional clarity of outline at the neck section, the part is rolled after trimming.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.



Here's the newest of MB engine mounts. It's engineered for strength . . . built for light weight. It offers a replacement that saves valuable pounds per engine set.

Designed specifically for Pratt & Whitney R-2800C engines, the Type 3900 MB mount is currently being installed in military aircraft. It has USAF, BuAER and CAA approval.

This latest development joins the famous family of MB engine mounts used *during the last 15 years* by most major aircraft manufacturers to isolate power plants from airframe.

Only MB deals with vibration engineering in *all* its phases – with vibration testing as well as control. This background assures you expert help in engineering complete engine mounting systems.

the **MB** *manufacturing company, inc.*

1060 State Street, New Haven 11, Conn.

HEADQUARTERS FOR PRODUCTS TO ISOLATE VIBRATION

. . . TO EXCITE IT . . . TO MEASURE IT

modernization of land and sea forces and maintaining them at a personnel level somewhat lower than during the Korean conflict," Wilson says.

His report states the estimated expenditure of $37.6 billion during fiscal 1955 will be as follows: 43% by USAF, 28% by Navy, 27% by Army and 2% for interservice activities.

Directive Sets New Progress Pay Policy

Progress payments to defense contractors with long lead time contracts are considered reasonably necessary, within prescribed percentages, without regard to the contractor's ability to borrow, Defense Secretary Wilson has ruled.

A long lead time, called for by the bulk of the aircraft industry's defense contracts, normally approximates six months between the beginning of work and the first delivery.

▶ **Limits Reaffirmed**—Responsible contractors can obtain progress payments on the types of contracts in which such payments have been traditional without furnishing projections of cash receipts and expenditures or other demonstration of need for progress payments, the Wilson directive states.

Both production and research and development contracts, where progress payments are based on costs, are affected by the new directive. The directive (No. 7840.1) cancels a previous order, dated Feb. 15, but reaffirms payment limitations of 75% of total costs or 90% of direct labor and material costs (AVIATION WEEK Mar. 1, p. 14).

Percentages over the prescribed standards require special approvals and demonstration of need, including nonavailability of borrowings. With such special approvals and demonstration of need, the directive says, progress payments also may be provided in nontypical cases if pre-delivery expenditures in a contractor's particular circumstances will be large in relation to the contract price and his working capital and credit.

▶ **Payment Formula**—Standard rates for liquidation of progress payments are provided, Defense says, so that a contractor who receives 75% of all costs, as in progress payments, will receive no more than 25% of the contract price of items as they are delivered until the advances have been recovered from the contract price of delivered units.

The directive says progress payments will be discouraged on relatively small contracts of the larger contractors, such as orders totaling less than $1 million, to minimize administrative effort and expense. It applies to new procurement, however, for all contracts, including existing contracts.

The directive requires progress pay-

FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau

Encountering thin, patchy stratus about 900 feet in late afternoon, be on guard for rapid increase in cloud cover and lowering of base, especially with steady southerly winds and clear skies above.

← **Learn the significance** of "Spread"! The less the difference between Air Temperature and Dew Point Temperature—the greater the risk of fog. Don't trust spreads less than 5° F. at night.

When destined to a coastal airport, pick an inland alternate, especially in spring when the water is still cold and may cool an onshore wind to the dew point.

Air Temperature	60° F.	NO FOG	Air Temperature	60° F.	FOG
Dew Point	55° F.		Dew Point	55° F.	
Water Temperature	58° F.		Water Temperature	50° F.	

In general, in estimating fog conditions, expect no ceilings with winds less than 5 m.p.h. Expect a ceiling when winds are 10-30 m.p.h. An important exception may occur when sea fog blows inland over a cold land mass with strong winds and near zero ceiling.

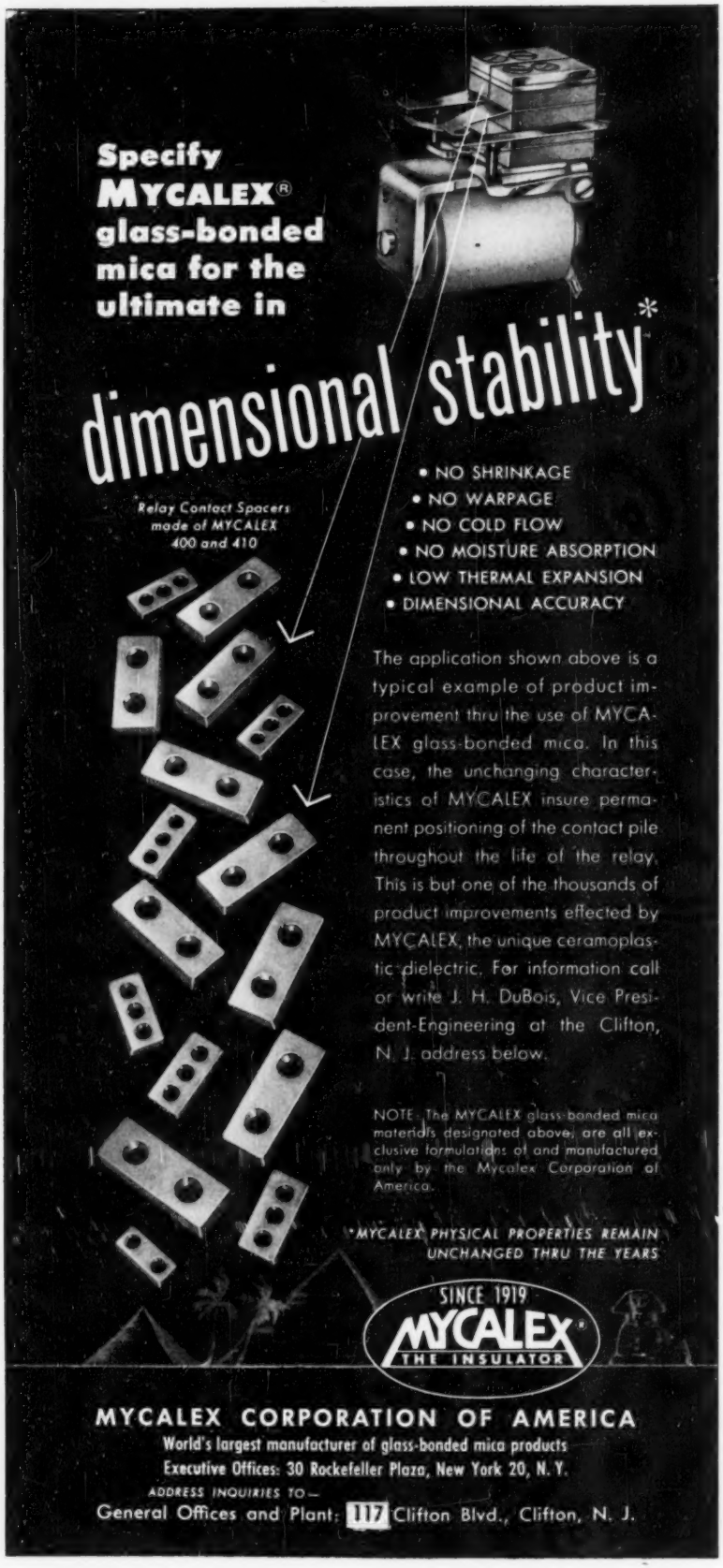
Best Pair to Get You There

WATCH FOR changing weather and fly with a wide margin of safety. Keep your tanks filled with Mobilgas Aircraft—the high-power aviation gas. Protect your engine with Mobiloil Aero—the world-famous aviation lubricant. These top-quality products meet rigid requirements of the Army and Navy—are your assurance of top-flight performance whenever you fly. Fly safely. Fly with the Flying Red Horse!

Mobiloil AERO

Mobilgas AIRCRAFT

SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.


Specify
MYCALEX®
glass-bonded
mica for the
ultimate in
dimensional stability*
Relay Contact Spacers
made of MYCALEX
400 and 410
• NO SHRINKAGE
• NO WARPAGE
• NO COLD FLOW
• NO MOISTURE ABSORPTION
• LOW THERMAL EXPANSION
• DIMENSIONAL ACCURACY
The application shown above is a typical example of product improvement thru the use of MYCALEX glass-bonded mica. In this case, the unchanging characteristics of MYCALEX insure permanent positioning of the contact pile throughout the life of the relay. This is but one of the thousands of product improvements effected by MYCALEX, the unique ceramoplastic dielectric. For information call or write J. H. DuBois, Vice President-Engineering at the Clifton, N. J. address below.
NOTE: The MYCALEX glass-bonded mica materials designated above, are all exclusive formulations of and manufactured only by the Mycalex Corporation of America.
*MYCALEX PHYSICAL PROPERTIES REMAIN UNCHANGED THRU THE YEARS
SINCE 1919
MYCALEX®
THE INSULATOR
MYCALEX CORPORATION OF AMERICA
World's largest manufacturer of glass-bonded mica products
Executive Offices: 30 Rockefeller Plaza, New York 20, N. Y.
ADDRESS INQUIRIES TO—
General Offices and Plant: 117 Clifton Blvd., Clifton, N. J.

ments to be paid promptly when earned and billed in accordance with contract provisions, in the absence of overpayment, anticipated loss or unsatisfactory performance, without regard to a contractor's actual need for funds at the time.

▶ **Periodic Evaluations**—"Progress payments require careful administration to insure against overpayments and losses. In all cases the physical progress of the work should be evaluated periodically to assure that the progress payments are fairly supported by the value of the work actually accomplished on the undelivered portion of the contract in conformity with the contract requirements," the directive states.

"Also, the unliquidated progress payments should not be permitted to exceed the percentage specified in the contract of the costs forming the base for progress payments, applicable only to the partially finished undelivered portion of the contract."

▶ **Management Factor**—"The extent of supervision required, whether for loss prevention or for avoidance of overpayments, should vary inversely with the experience, performance record, reliability, quality of management, and financial strength of contractors, and with the adequacy of their accounting system and controls," Wilson's order says.

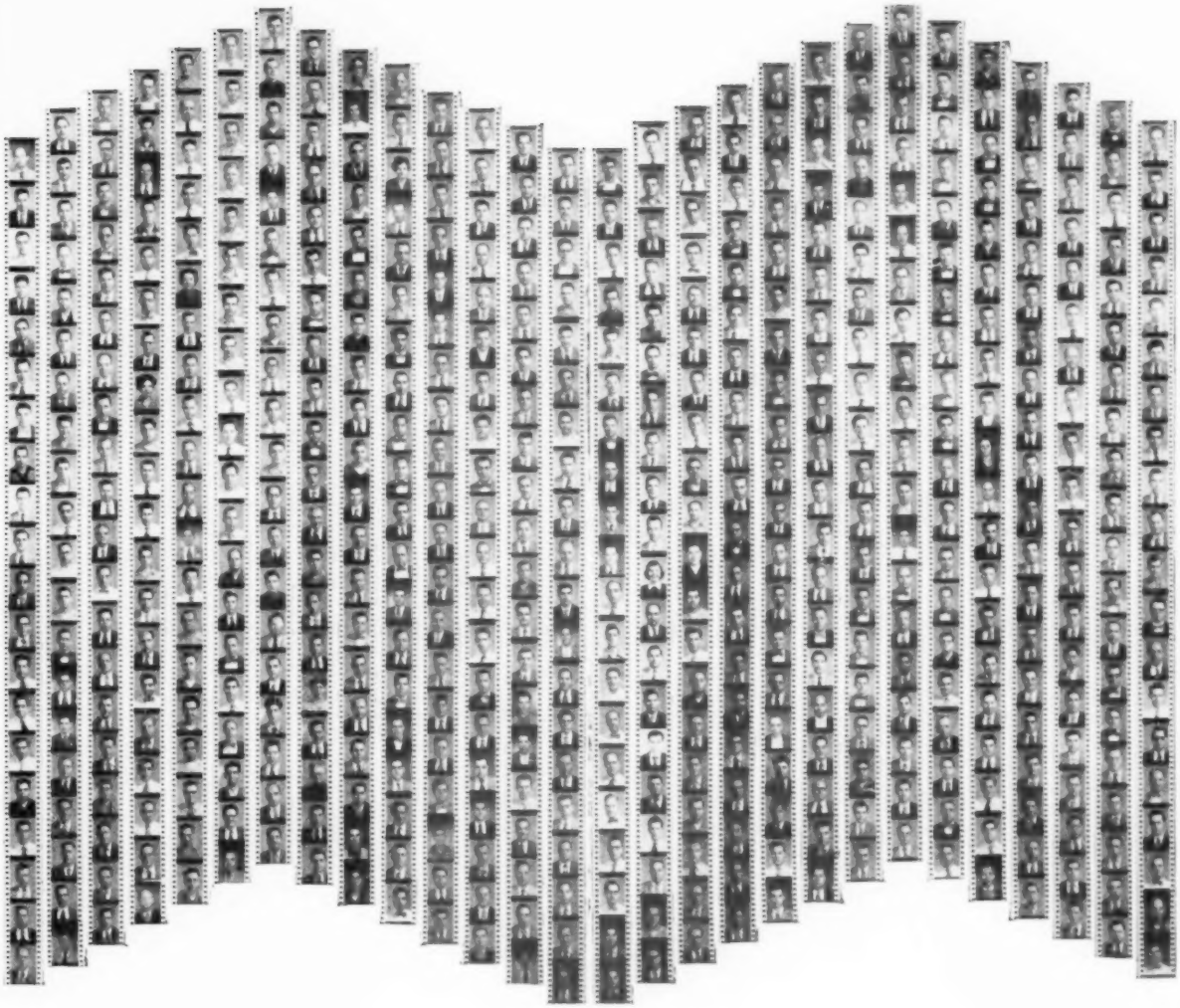
"Review should be of a kind and degree that will be sufficient, consistent with the circumstances of individual cases, to provide timely knowledge of circumstances that would adversely affect contract performance and the liquidation of progress payments, and timely opportunity for any action that may be appropriate for the protection of the government. "Particular care must be taken to assure that the unpaid balance of the contract price will be adequate to cover the anticipated cost of completion, or that the contractor has adequate resources to complete the contract if the unpaid balance of the contract price is inadequate to cover costs of completion."

Additional directives are planned by the Defense Department to deal more comprehensively with progress payments, particularly those based on percentages of physical completion of the contract.

Three Aviation Firms List Top Salaries

Three aircraft companies report these salaries of more than $30,000 were paid during 1953:

United Aircraft Corp.: H. M. Horner, president, $185,840; Leonard S. Hobbs, vice president-engineering, $139,800; Frederick B. Rentschler, board chairman, $125,550; and William



you are looking at 560 electronics engineers

This concentration of mindpower—the equivalent of nearly 4,000 years of experience in the new science of electronics—is part of a team of 2200 specialists in the Engineering Division of Martin. It is also part of a major development in the aircraft industry.

For the electronics requirements of today's weapons systems are an increasingly critical factor in the cost of airpower, involving navigation, guidance, search, fire control, communications and a rapidly growing number of operational functions.

Martin's top-rated electronics resources are a vital part of the balanced and integrated system of engineering skills essential today to the production of optimum weapons systems at maximum efficiency and economy.

Take the case of the U.S.A.F. B-61 Matador, America's first successful pilotless bomber:

This major weapon is being produced for a fraction of the cost-per-pound of equivalent piloted aircraft . . . another long-range payoff on Martin Systems Engineering, which is delivering more airpower at less cost to our Government and the American taxpayer.

You will hear more about Martin!

Martin AIRCRAFT

THE GLENN L. MARTIN COMPANY
BALTIMORE • MARYLAND

the Common Denominator

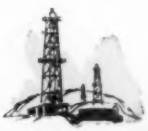
of all industries...

Bolts and special fasteners are the common denominator of all industries. **VOI-SHAN** has the skill and experience to design and manufacture the correct fastener for your specific need.

AIRCRAFT

RAIL

AUTOMOTIVE



OIL TOOL

MARINE

VOI-SHAN

MANUFACTURING COMPANY, INC.

Serving the Aircraft, Automotive, Marine, Rail, and Oil Tool Industries

8463 HIGUERA STREET • CULVER CITY, CALIFORNIA

SALES OFFICES: NEW YORK—Arrow Sales Co. • INDIANAPOLIS—The Suse Co. • WICHITA—Aviation Products Co. • PHOENIX—The Circle Sales Co. • SAN FRANCISCO • SAN DIEGO

R. Robbins, vice president-controller, $111,059.

Republic Aviation Corp.: Mundy I. Peale, president and general manager, $114,059; John J. Ryan, vice president, $59,994; Alexander Kartveli, vice president-chief engineer, $51,980.

Fairchild Engine & Airplane Co.: Richard S. Boutelle, president, $113,438; Arthur F. Flood, executive vice president-comptroller, $81,434; and Willard L. Landers, vice president, $56,796.

H-Bomb Touches Off Australian Air Buildup

(McGraw-Hill World News)

Melbourne—A new look for Australian defense forces with sharply increasing emphasis on airpower is in the making, according to informed sources here. Three key factors have led to important changes in policy by the federal government:

- Impact of hydrogen bomb developments.
- Recent outspoken criticism of Australian defense policies by Air Vice Marshal J. D. I. Hardman, retiring chief of the Royal Australian Air Force.
- Considerable pressure by Allied and Australian experts who have been advising the government to pay more attention to the air force at the expense of ground and naval airpower.

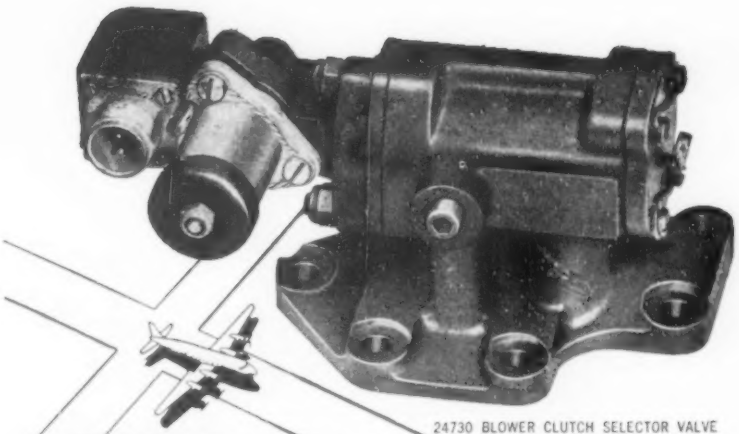
▶ **Millions for Bombers**—At least $60 million is slated to be spent on heavy bombers for the RAAF within the next two or three years. Australian purchasing officials have been thinking in terms of British types, such as the Avro Vulcan or Vickers Valiant. Should they be difficult to obtain, U. S. models may be ordered.

Once defense allocations are decided, orders for other new types also will be given high priority under the new plans to make aviation Australia's principal military force. Air force personnel say further Lockheed P2V Neptunes should be purchased. Australia's present fleet of Neptunes turned in an "extraordinary" performance during recent maneuvers.

Additional orders for Australian-built Canberra jet bombers and F-86 Sabre fighters will depend on speed of deliveries of ordered planes and their modernity.

▶ **Training Problem**—The RAAF is having trouble training needed personnel. The federal government expected the air force to get some 10,000 national service trainees, but the RAAF received only 3,500 and was unable to handle these.

It is possible that orders for additional training equipment will be placed.



ADEL

ENGINE ACCESSORIES

Precision-Built . . . Performance-Proved . . .

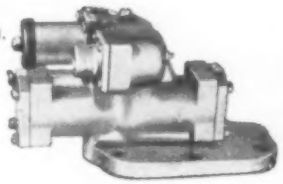
USED BY MAJOR AIRLINES AND AIRFRAME MANUFACTURERS

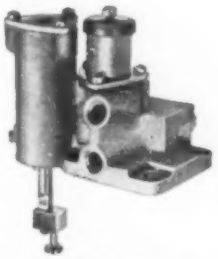
Valves and actuators you can specify with confidence. Provide fail-safe operation in case of electrical failure. Light weight.

Operating fluid: Engine Oil.
Duty: Continuous.
Solenoid: Single-coil, internally grounded.
Electrical Range: 18 to 30 volts dc.
Current drain: 0.5 amp at 24 volts.
Corrosion resistant construction.

24730 BLOWER CLUTCH SELECTOR VALVE
For use on Pratt & Whitney R-2800 engine.
Controls operation of two-speed supercharger. Electrical control is positive in action. Current failure returns valve to normal position, placing supercharger in low gear.
Weight: 2.2 lb.

24793 SUPERCHARGER CONTROL ACTUATOR
For use on Wright R3350-30 engine.
Provides positive control of two-speed supercharger with complete immunity to pressure surges in the operating fluid. Durable and dependable.
Weight: 1.75 lb.





26153 SUPERCHARGER CONTROL VALVE
For use on Pratt & Whitney R4360-63 engine.
Directs oil flow from pressure supply to high blower. Rated flow—9 gpm.
Built-in stamina provides dependable performance under extreme vibration conditions.
Weight: 1.9 lb.

25805 SUPERCHARGER ACTUATOR
For use on Wright R1820-103 engine.
Converts hydraulic pressure to mechanical push-pull actuation. Electrically controlled. Combines reliable operation with proven design . . . rugged construction.
Weight: 1.95 lb.

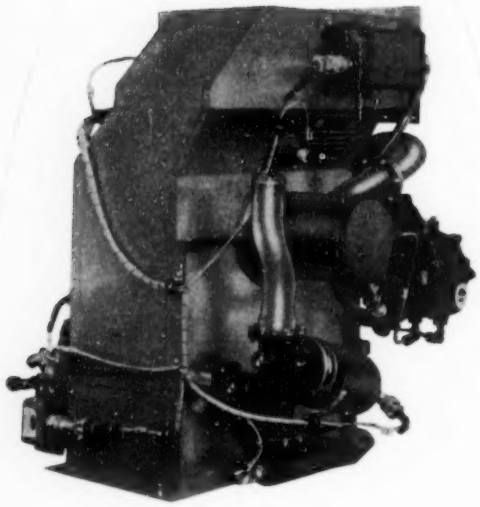
Write for new, descriptive Brochure containing detailed information on ADEL's line of Aircraft Equipment and facilities. Address ADEL DIVISION, GENERAL METALS CORPORATION, 10775 Van Owen St., Burbank, Calif.

ADEL produces a complete line of Aircraft HYDRAULIC & PNEUMATIC CONTROL EQUIPMENT, HEATER, ANTI-ICING & FUEL SYSTEM EQUIPMENT, ENGINE ACCESSORIES AND LINE SUPPORTS.

ADEL PREFERRED FOR AIRCRAFT THE WORLD OVER

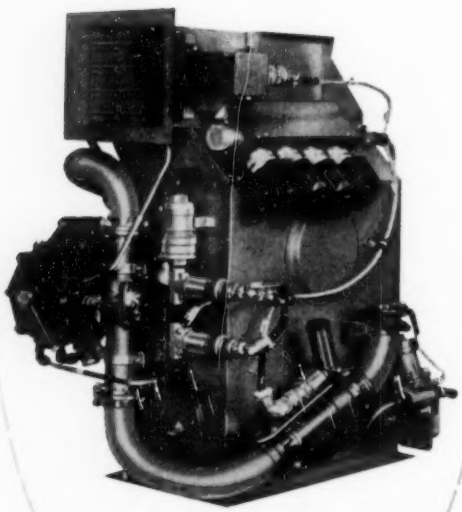
DIVISION OF GENERAL METALS CORPORATION • BURBANK, CALIF. • HUNTINGTON, W. VA.

CANADIAN REPRESENTATIVE: RAILWAY & POWER ENGINEERING CORPORATION, LIMITED



Now
it can be shown

Janitrol Purge Gas Generator



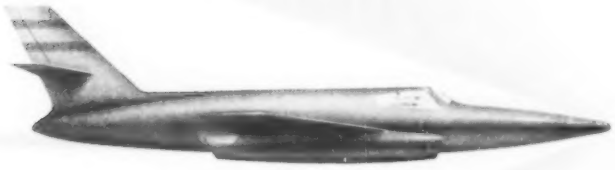
14" x 16" x 24"

a
positive
contribution
to safety
in flight

The hazard presented by explosive vapors in fuel cells and surrounding areas is eliminated by this positive, passive defense method for safety in flight—a product of Surface Combustion's more than 37 years experience in combustion engineering and atmosphere preparation.

The generator pictured on the opposite page—for a new jet aircraft—is one of several models that have been undergoing steady development since 1949, based on the proven theory that combustion is the most economical and efficient method of supplying large quantities of inert gas for aircraft protection.

The Janitrol unit weighs less than 90 pounds—occupies only 3 cubic feet—produces more than 10 lbs./min. of inert gas for complete, passive, explosion and fire defense from "natural" causes as well as enemy action. The pilot need flip only one switch to set the generator into operation, from there on operation is automatic and continuous. Generated gas is dumped overboard until the proper degree of "inertness" is established, then the gas is supplied to fuel cells and surrounding area on a demand basis—



determined by pressure—continuously, until the generator is shut down by the pilot. Even after shutdown, there is an automatic "purging" action within the generator to assure that all fuel is exhausted from the generator system, and that all volatile vapors are cleaned out before operation stops automatically.

The versatility of Janitrol's new "dimple-plate" heat exchanger principle permits construction of generators in virtually any configuration to meet installation requirements on planned, as well as existing aircraft.

Inquiries relative to civil aviation applications are invited.

37 years experience in combustion engineering

Janitrol

AIRCRAFT-AUTOMOTIVE DIVISION
SURFACE COMBUSTION CORPORATION
Columbus 16, Ohio

National Sales, Engineering, Production Headquarters, 400 Dublin Ave., Columbus 16, Ohio. District Engineering Offices: New York, 225 Broadway; Washington, D. C., 4650 East-West Highway; Kansas City, 2201 Grand Ave.; Ft. Worth, 2509 West Berry St.; Hollywood, Calif., 7046 Hollywood Blvd.; Columbus, Ohio, 400 Dublin Ave. Executive Offices: 2375 Dorr St., Toledo 1, Ohio.

SKI-FITTED CUB can be based on small wooden raft, needs only low forward speed to stay on surface of water. No flotation is built into airplane. Test pilot Joe Barclay shows hands-off stability of ski arrangement pioneered by All American to hit its . . .

Target: Breaking the 'Runway Barrier'

Helping aircraft take off or land in minimum space ranks high among projects of All American firm.

By David A. Anderton

Wilmington, Del.—"Breaking the runway barrier" is a phrase that the All American Engineering Co. staff uses informally to describe one type of engineering work they tackle.

Most of the problems in the company's development mill have to do with getting aircraft on and off the earth's surface in minimum distance for minimum cost. "The runway length situation is getting out of hand," says AAE vice president Robert Cotton, "and we're trying to help the services and commercial operators do something about it."

That something—which started back in 1938 with glider and air mail pickup schemes—now includes special types of arresting gears and catapults, and a different, pioneering approach to hydro-ski design: the "hydro-lift" system in which the airplane uses water as a transition surface between a small hard-stand and flight.

In other fields, the company has engineered a new approach to instrument lighting, an ejection seat trainer, an air-transportable mooring mast for blimps, and lightweight, high-power winches for lighter-than-air craft and helicopters.

▶**Policy Statement**—"Our policy is to translate ideas into developed and tested hardware," says president Charles Wendt. "Somebody can come to us with a problem and we will come up with the solution, engineer the design and build and test the hardware."

Although the company specializes in research and development, it is set up for small-scale production, says Wendt.

Basic field of All American activity is aviation, but company policy calls for expansion into other fields. The staff believes there is considerable potential for growth—it knows of no other company doing a similar job.

"Our work load is quite high, but there's more work available," says Wendt. "We're actively recruiting and expanding."

Behind the growth of All American is a group of young engineers. Vice presidents Cotton and Donald Doolittle are 38 and 34 years old. Raymond Janney, chief engineer, is 32, and all senior project engineers are that age or younger.

Started in 1938 to develop air pickup techniques for local airmail service, the firm expanded its ideas into systems which snatched nine-ton gliders off the fields of England for the invasion of the Normandy coast 10 years ago.

Today AAE works on more than 40 different projects, most of them under the cognizance of Navy's Bureau of Aeronautics.

▶**Hydro-Lift Airplane**—All American has jumped into the problem of water-based aircraft up to its landing gear—a

ALL AMERICAN ENGINEERING CO. shop and offices at du Pont Airport, as seen from the air. Wheel against hangar at extreme right is AAE's "continuous" tow tank. Air-transportable blimp mooring mast is spread out in front of hangar.

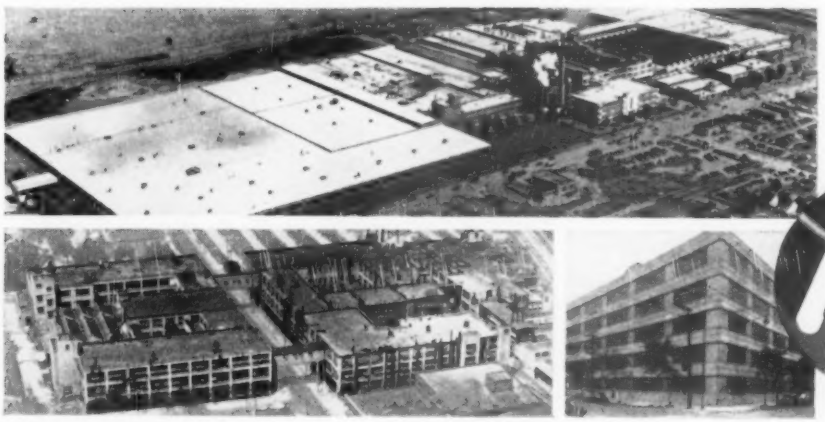
Good Management—key to America's defense...

. . . and good management is the key to AC's ability to turn out many of the electro-mechanical marvels which guard America's shores.

Through good management, engineers with the necessary training, experience and imagination can be used to best advantage. It takes good management again to provide these men with the specialized equipment and facilities they need—when and where they need them.

That kind of good management can build a "homing instinct" into antiaircraft shells—as AC is doing in the T-38 Skysweeper Fire Control Systems. AC is building pin-point accuracy into Gun-Bomb-Rocket Sights that are modern miracles of engineering and design.

AC is always looking for *new* problems in this field. If you have such a problem, good management may be the answer—and the "know-how" and experience of more than 700 AC engineers and scientists are at your service.



3,000,000 square feet of the most modern facilities in three huge AC plants—Dort Highway Plant in Flint, Industrial Avenue Plant in Flint, and the Milwaukee Plant.

GM GENERAL MOTORS GM GOOD MANAGEMENT

AC QUALITY PRODUCTS

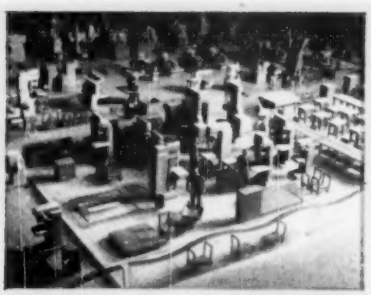
AC SPARK PLUG DIVISION . . . GENERAL MOTORS CORPORATION, FLINT, MICHIGAN

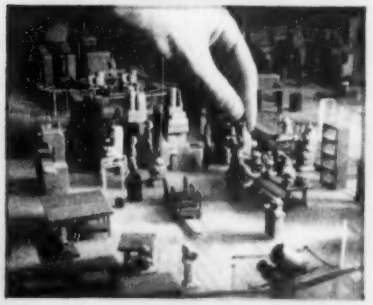
DEFENSE PRODUCTS of High Quality at Low Cost DELIVERED ON TIME

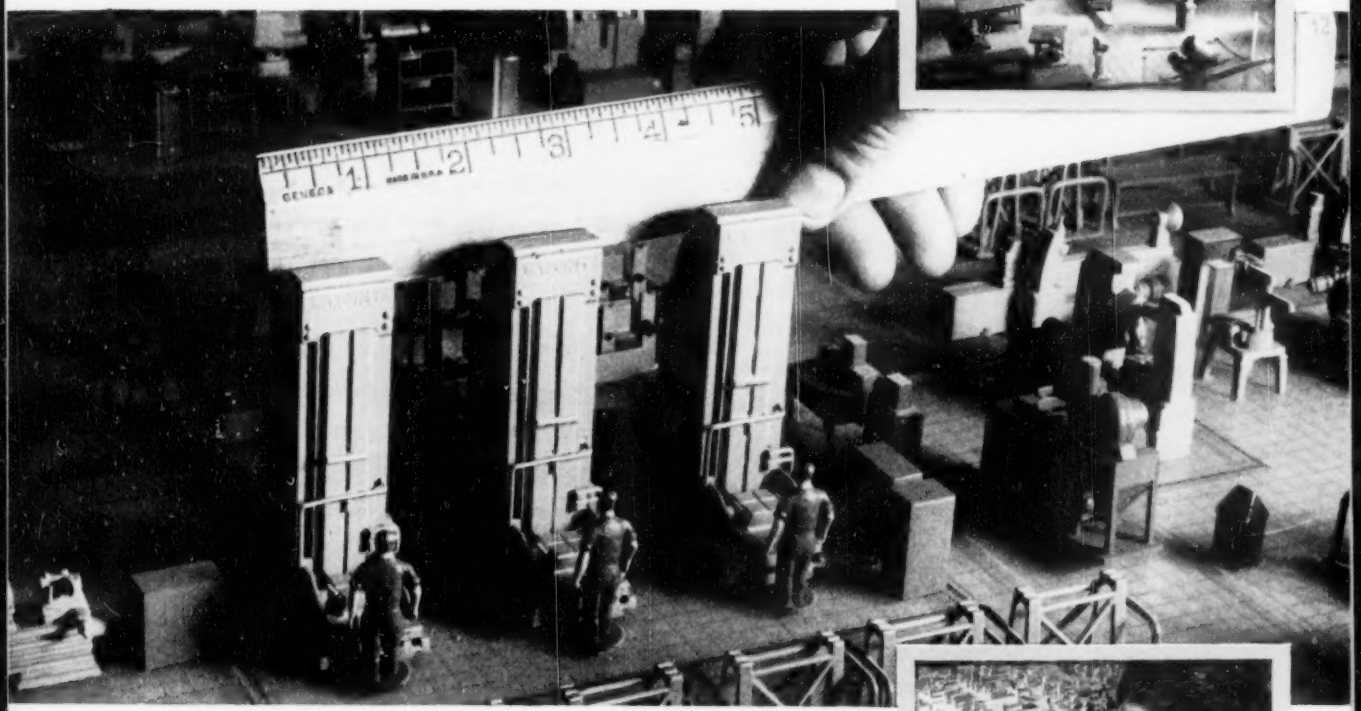
FACTS ABOUT

FAIRCHILD
Engine Division

PRODUCTION ENGINEERING







3-D . . . in miniature . . . has an important production engineering role at the Fairchild Engine Division. Scaled-down duplicates of the big production lines save countless dollars and untold man hours . . . make possible complete pre-planning before actual production of turbojet engines, auxiliary powerplants and other power products begin.

Miles of blueprints for new floor plans are eliminated. Instead, technicians simply arrange scale models to arrive at the most efficient production layout. Then, actual plant layout is set up to agree with the scale layout. Advanced techniques like this are a part of *planned* production engineering at Fairchild . . . pushing efficiency up and costs down on major projects for *all* the Armed Services.

ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Engine Division
FARMINGDALE, N. Y.

AIRCRAFT DIVISION, Hagerstown, Maryland • GUIDED MISSILES DIVISION, Wyandanch, N. Y.
SPEED CONTROL DIVISION, Wickliffe, Ohio • STRATOS DIVISION, Bay Shore, N. Y.

very unusual landing gear which can be adapted to a land-based airplane.

The AAE hydro-lift gear resembles a pair of water skis and can be attached with minor modifications to the landing gear legs of a land-based craft. There is no extra flotation built in or added to the airplane. The wheels protrude a little below the lower surface of the ski, so that the plane can taxi on the ground or on the small hardstand that serves as its water base.

Takeoff starts on the hardstand, which in the company's tests was a raft—the "USS Balsawood"—anchored in Chesapeake Bay. It was about 100 ft. long. The aircraft runs along the raft and by the time it has covered a distance of about three to four times its own length, it has reached a speed which will let it plane on the water surface.

It continues to plane until takeoff speed is reached.

Landing is routine, with the pilot continuing to taxi across the water and up on the raft. The company says that with a little practice the pilot can stop with a ramp run of about two airplane lengths.

All American's pilots have made thousands of landings and takeoffs from beaches, hardstands and ramps in a research program conducted mostly for the Navy on a group of several airplanes. The largest was the standard SNJ-5C Navy trainer, but company engineers say that there is no reason the gear couldn't be adapted to an airplane of any size.

► **Facilities**—All American's offices and shop buildings front on one of the sod runways of du Pont Airport at Wilmington. About one-third of the employes are rated pilots; they can walk out of the door at quitting time and take off within a few minutes to log some flight time before supper.

The factory has about one of every tool needed to make metal images of the black-and-white lines of engineering drawings. Precision machines share floor space with benches for hand work, and there are two small, but excellently equipped machine shops.

In addition to the du Pont airport space, All American has leased about 150 acres at Sussex County Airport at Georgetown, Del. That airport is a former Naval air training station and has three main concrete runways.

A third flight-test facility is on Chesapeake Bay, and is used for the company's hydrodynamic tests.

Among special facilities, All American maintains a small windtunnel now doing cascade airfoil research, a jet engine test stand, and a "continuous" towing tank for tests of water-based airplane models.

► **Ingenious Solution**—The "continuous" water basin might be considered typical of the ingenuity applied to All American engineering problems. De-

Aviation Week Picture Brief

'TATER CHIP was designed and built by Ned Kensinger of Aircraft Repair Service, Peoria, Ill., to wrest the midget speed title from Steve Wittman. In 190-cu. in. displacement class, it does 265 mph.

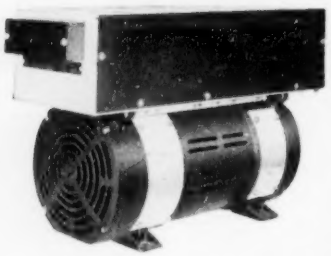
Tiny Sportplanes Make Debut

Home building of aircraft has made marked gains in recent years with emphasis on midget, high-performance types using small powerplants. Here are a few recent experimental licensed models. Others appeared Jan. 18.

YELLOW JACKET was built by Gilbert and Bruce Pitt, Hales Corners, Wis., of parts from 15 different planes, including a midget racer. Powered by a Continental C85, the 14-ft.-span sportplane has 150-mph. top speed and cruises at 130 mph.

LITTLE AUDREY sportplane was made by Paul H. Poberezny, Milwaukee, president of Experimental Aircraft Assn., which advocates private building of small craft. Audrey is derived from Benny Howard's Pete racer; it has a 75-hp. Continental, spans 18 ft., weighs 800 lb. and has top speed of 140 mph

The most complete line of AIRCRAFT INVERTERS



The Red Bank Division of Bendix Aviation Corporation is the logical place to find your answer to aircraft inverter needs—and for three significant reasons. First, we offer the widest range of inverters. Second, we design and build each inverter as a complete, unified mechanism. Third, we are equipped to design and produce inverters for all kinds of special-purpose applications . . . and, in fact, are now engaged in developing inverters up to 5000 VA and for high temperature, high altitude applications. Our current production models are described below. For complete details on these and also on special-purpose designs, write Aircraft Inverter Section, Bendix Red Bank Division, Eatontown, N. J.

INVERTERS—400 CYCLE OUTPUT

Type Number	INPUT		OUTPUT			Approx. Weight Lbs.	Max. Alt. Feet	Designed to Government Part No.
	Volts	Amps	Volts	Phase	VA Rating			
12128	27.5	1	26	1	6	5	35000	AN3496-1
12126	27.5	2	26	3	10	6	35000	N1020-SK
MG-54	27.5	22	115/200	1	250	17	65000	E-5109
				3	250			
12142	27.5	22	115	1	250	13	35000	N-17158 Navy
				3	250			
12146-1	27.5	22	115	1	250	13	35000	53B6239 AF
12146-3	27.5	22	115	1	250	13	35000	—
				3	250			
MG-60	27.5	22	115	1	250	17	50000	53B6239 AF
MG-62	27.5	22	115	3	250	17	50000	AN3532-2
32E01	27.5	35	115	1	500	25	50000	AN3533-1
				3	500			
32E00	27.5	45.54	115	1	500	34	50000	AN3534-1
				3	750			
MG-57	27.5	100	115/200	1	1250	42	50000	E1737-1 Navy
				3	1500			
MG-61	27.5	100	115	1	1500	56	65000	53C6767
MG-64	27.5	100	115	3	1500	56	65000	—
MG-70	27.5	105	115/200	1	1500	56	65000	—
				3	1500			
1518 Mod. 1 & 2	27.5	130	115	1	1500	37.5	20000	—
				3	1800			
1518 Mod. 5	27.5	130	115	1	1500	37.5	35000	—
				3	1800			
32E06	27.5	180	115/200	1	2250	56	50000	E1725 Navy
				3	2500			
32E03	27.5	160	115	1	2500	61	50000	53B6227
32E09	27.5	180	115	1	2500	56	50000	—
				3	3000			

NOTE: D.C. Input voltage shown is a nominal value of 27.5 volts, but all units are designed to operate from 26 to 29 volts. Input amperes shown are values at 27.5 volts input.

Manufacturers of Special-Purpose Electron Tubes, Inverters, Dynamotors and Fractional HP D.C. Motors.

Bendix

EATONTOWN, N. J. Red Bank

DIVISION OF Bendix AVIATION CORPORATION

THE NAME Bendix MILLIONS TRUST

West Coast Sales and Service: 117 E. Providencia Ave., Burbank, Calif. • Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.
Canadian Distributor: Aviation Electric Ltd., P.O. Box 6102, Montreal, P. Q.

BAILOUT TRAINER developed for Navy's Special Devices Center is 25 ft. high, but collapses for easy transport.

veloped for the Office of Naval Research, the tank grew out of the length limitations of the towing basins available at such installations as NACA, the Navy's David Taylor Model Basin or Stevens Institute of Technology. These highly instrumented, accurate test facilities are expensive; they are also limited in test duration by the physical length of the tank.

Some of the early development work with the hydro-lift airplane required long test runs to produce qualitative data rather than the multi-point test data generally obtained in the more sophisticated facilities.

So All American engineers designed, built and are operating a water towing basin with an unlimited test run. It resembles an old-fashioned water wheel; it is basically an open-sided wheel made from a closed circular channel and braced on one side of the hub only. The other side is open.

To test, the channel is partly filled with water and the wheel is spun. As speed picks up, centrifugal force flattens the water into a uniform layer around the inside of the wheel.

Models are brought in the open side of the wheel on a boom and lowered to contact the water. Duration of the test is for as long as the wheel is whirled.

In effect, this is analogous to wind-tunnel operation where the model is fixed and the working medium moves past the model. It is a "quick-and-dirty" test rig. But if it proves feasible, it will be able to supplement the data of the more sophisticated tests.

▶ **Bailout Trainer**—Using an ejection seat should be almost a reflex action for a pilot in a crippled airplane. But to acquire the easy familiarity with the seat, a pilot has to practice. Hence the ejection seat trainer, a simulator designed, developed and produced by All American for the Special Devices Center of ONR.

This trainer simulates the seat ejec-

WHY IT PAYS TO BUY STAINLESS BARS FROM US

TRIPLE SECURITY

What you want
When you want it
At the **right price**

ONE of our experienced stainless men will be glad to work with you on stainless steel selection problems so that you can use the most effective and economical grades and sizes. And we follow through from design to delivery to make sure that you get exactly the steel specified for the job. With complete stocks of dependable USS Stainless Steels, fast delivery service, and competent, thorough technical assistance, we offer a real cost-cutting combination.

Whatever your demands, it'll pay you to call on U. S. Steel Supply the next time you need stainless steel. Our unusually complete stocks of USS Stainless include bars—rounds, squares, hexagons, angles, channels, and the widest selection of grades, sizes and finishes of sheets and strip available.

For further information on stainless steel, just send us the coupon.

U. S. STEEL SUPPLY

DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

USS

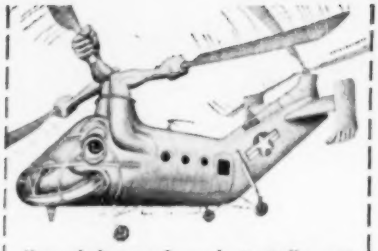
Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

U. S. Steel Supply
208 So. La Salle St.
Chicago 4, Ill.

Gentlemen:
Please send me, without obligation, your literature containing complete information on your Stainless Steel stocks and service.

Name.....
Company.....
Address.....
City.....State.....

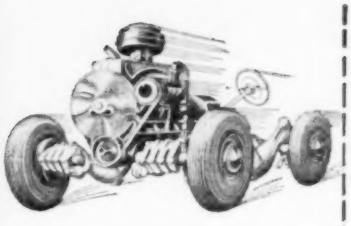


How a helicopter hangs by its "elbows"

For flexible "elbows"—625-part rotor assemblies that control the amazing maneuvers of its dependable H-21 "Work Horse" Helicopter—PIASECKI *looks to Lycoming!*

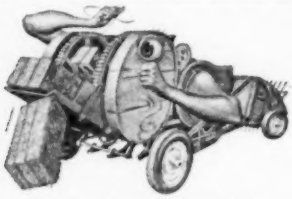
How a jet engine runs on its "nerves"

To produce the auxiliary "nerve center" for its J-40 jet engine—a complex gearbox that transmits power to vital engine accessories—WESTINGHOUSE *looks to Lycoming!*



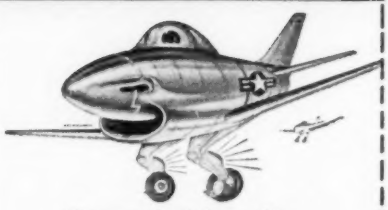
"Sinews" to give cars "go"

For vital automotive parts—mass-produced precision components that can "take it" year after year—leading automobile manufacturers like FORD *look to Lycoming!*



Strong "wrists" for America's new hay balers

For sturdy, dependable spur and bevel gears—"wrists" that drive the tying mechanism of its "one-man" time- and money-saving hay baler—NEW IDEA *looks to Lycoming!*



"Leg muscles" that cushion a jet's landing

For tough main leg cylinders that house the hydraulic action which enables the F-86 Sabrejet to absorb fast landing jolts—CLEVELAND PNEUMATIC *looks to Lycoming!*

Small parts that play a "big part"

Peak performance by any product requires big performance from small parts. Lycoming's skill at producing such custom parts explains why so many leading manufacturers look to Lycoming.

Look at Lycoming's record! Parts ranging from tiny precision-made aircraft gears to rugged mass-produced automotive parts. And scores of others produced for America's industrial and military leaders. All "living" evidence that Lycoming can solve *your* metal-working problem, too!

Aircraft executives please note.

If you need dependable parts . . . or any other diversified services listed with our signature . . . call us without obligation. Lycoming's wealth of creative engineering ability, its 2½ million square feet of floor space, and 6,000-plus machine tools stand ready to serve you. *Whatever* your problem . . . *look to Lycoming!*

Engineers Wanted:
Long-term contracts with U. S. Air Force for gas-turbine power plants provide unlimited opportunities for top-flight engineers. Write Project Coordinator for outlining experience in detail. Lycoming Division, Avco Mfg. Corp., Stratford, Connecticut.

Just off the press! "THE LYCOMING STORY"... 40 interesting, illustrated pages showing many ways Lycoming is ready to help you. Write for it on your letterhead.

Aircraft Engines
Industrial and Tank Engines
Engine Overhaul
Generating Units

Turbine Engineering and Research
Engineering Design and Development
Hardened and Ground Precision Parts
Gears and Machine Parts

Complete Assemblies
Heat-Treating and Plating
Steel Fabrication
Castings
Boilers

FOR RESEARCH • FOR PRECISION PRODUCTION

LOOK TO Lycoming

DIVISION OF AVCO STRATFORD, CONN.
Manufacturing plants in Stratford, Conn. and Williamsport, Pa.

tion procedure and the acceleration loads that the pilot will feel in an emergency bailout. It's about 25 ft. high, but is collapsible for easy shipment. Both Navy and Air Force have used the trainer in service.

Instrument lighting is another Special Devices contract. All American's approach to uniform lighting of an instrument dial was to locate the bulb in the center of the instrument, over the hub of the indicating hands. Current for the bulb is conducted through a sandwich of two layers of NESA glass and an insulator.

► **Organization**—There are about 180 employes in All American currently. The engineering department is organized on a project basis, with the project engineer in charge of a "vertical" group.

There is another divisional arrangement within the engineering department which splits the staff into four specialist groups, each under a senior project engineer.

Draftsmen and other service groups work with the project units, but some layout work is handled by the engineers themselves.

THRUST & DRAG

Not too long ago, there was a combustion symposium held in England. Two American experts in the field of flame propagation found themselves in a small hotel with one of those impossible English fireplaces, designed in accordance with no known aerodynamic principles at all. They labored long and mightily with paper, splinters, wood and coal. Smoke and not much flame resulted.

But they persevered, and finally got the entire hearth covered with a warming blaze. Dogtired, they crawled into icy beds to fall asleep in a rapidly warming room.

You guessed it: Couple of hours later they were frozen awake, teeth chattering and skin shivering in the cutting cold of an English bedroom.

* * *

Reverse thrust is the gimmick now; Boeing, Marquardt, certainly others in this country, Snecma in France, and de Havilland in England are jumping in with both feet.

Boeing's recent presentation recalled the observation of one of Britain's top designers over a cup of tea last Farnborough. "I've finally figured out why George Schairer is still sticking to pods," he said. "He'll just put a whacking great bearing in that strut, pivot the whole bloody engine around, and get 100% reverse thrust. Try that with a buried engine!"—DAA

THIS FIGHTER packs a SUPERSONIC PUNCH

thanks to "MUSCLES" of

CON-SOL Forgings

First Air Force jet fighter to exceed the speed of sound in level flight, this new, North American F-100 Super Sabre is considered to be a greater advance over the Korea-famed F-86 Sabre Jet than the Sabre was over the F-51 Mustang of World War II. Exact performance figures are still classified . . . but it's no secret that both titanium and aluminum forgings by Consolidated play an important part in making this performance possible. Tough, strong and dependable . . . like the muscles of a well trained fighter . . . they help to deliver the knockout power that can assure air superiority.

Furnishing forgings to most of the manufacturers of planes, engines and helicopters, Consolidated produces forgings for both the F-100 airframe and its powerful Pratt & Whitney Aircraft J-57 jet engine.

Whether you're building planes for punch, pay-load or play, Consolidated Industries, Inc., has the experience, know-how and up-to-the-minute facilities to produce forgings (in aluminum, titanium, alloy steel and other metals) that meet your most exacting specifications.

Write for complete information.

CONSOLIDATED INDUSTRIES, INC.

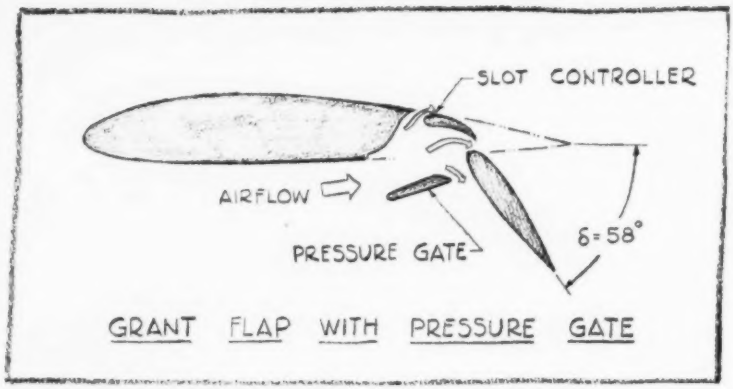
Specialists in Aircraft Forgings

105 MIXVILLE ROAD, WEST CHESHIRE, CONN., U.S.A.

West Coast Representative

A. C. Stearns Co., 3911 San Fernando Road, Glendale, Calif.

ENGINEERING FORUM



GRANT FLAP WITH PRESSURE GATE

With this issue Aviation Week reintroduces Engineering Forum, a feature originally presented several years ago as a sounding board for engineering opinion. Now its function is being expanded to serve as a showcase for ideas of technical merit.

In this first article, a consultant's series of slotted flap designs is featured. Subsequent articles will include an unconventional powerplant for long-range, highspeed aircraft; a pair of novel helicopter proposals, and an unusual design for a personal amphibian.

Engineering Forum invites your contribution to the store of ideas in aeronautical engineering.

How to Give Wings More Lift

A series of slotted flap designs which are claimed to produce section lift coefficients as high as 4.0 is being offered to aircraft designers by Charles H. Grant, an aeronautical consultant of New Rochelle, N. Y.

Grant, who has been working on the high-lift problem for over 30 years—his first flap design was used on the Dayton-Wright racer in 1921—evolved the present series of flaps from experiments which began in 1935.

Through an unusual coincident of parallel development, a Grant-type flap is used on the Martin 4-0-4 transport, although the Martin flap was designed by two of the company's engineers.

History

Grant began his development in a series of general studies aimed at producing high-lift devices. He toyed with leading- and trailing-edge rotors, and with variable-camber wings. But in the search for lift, he proved to himself that the answer lay in curving the entire wing section.

His first flap design in 1934 was a mechanical method of curving the wing. The trailing edge section was divided into five segments; a linkage pulled these down and together into a relatively smooth single curved surface.

Meantime Grant had begun what was to be a long and frustrating correspondence with the National Advisory Committee for Aeronautics. Advising them of his variable-camber ideas in early 1934, he followed through with a report on the multi-segment flap in the spring of 1936. Some of the technical staff of NACA prepared a criticism of the design, pointing out the complexity of the mechanism and the slight advantage of the curved wing.

Then Grant revised the layout of the flaps to incorporate a series of open slots between each flap segment. The idea behind this was to control the boundary layer over the flap.

A windtunnel model of this design was tested at New York University in late 1936. As tested, the flap was 45% chord with four segments.

The maximum section lift coefficient from the tests was 2.64 at a Reynolds' number of 389,000; that was higher than values for other contemporary flaps by a good margin, according to Grant.

Lessons Learned

The tests showed Grant some basic parameters of flap design. By analysis, he concluded that four segments and slots was more than enough, and that three or possibly even two would do the job.

Additional research and some flight tests made with models to get qualitative data showed that two segments worked. So there was the package and Grant tied it up with a patent application dated May 1936. The application covered flap designs with two, three and four segments and the operating mechanism for them.

In October 1938, NACA reported tests on a two-segment flap of about 26% wing chord, which Grant says verified some of his earlier tests.

Refinements

With basic design established, Grant turned to refining the flap.

- Aileron action was incorporated in a system involving a double-slotted flap.
- Slot controller was patented. This "extra" controlled the flow of air from below the wing.

Grant says that more confirmation came in August 1940 with NACA tests of a 40%-segment chord, two-segment flap, with slight variations from pre-1938 design. Section lift coefficients reached as high as 3.46 with the large-chord arrangement.

Simplification

Next step was to reduce the number of segments to one. Grant felt this could be done by further work on the slots, and developed a variable-slot control which provided the answer. In effect, this did the job of the first segment of flap, but did not have to be disconnected from the main wing section to do so. The controller simply rotated a little, and its contour eased the air through the slot.

One phase of flap development added a slotted spoiler to the system for lateral control in a full-span application of the flaps. Grant recently was awarded a patent on this scheme, originally conceived in 1944 and applied for in 1945.

Most recent refinement is a presurizing gate, added below the wing surface when the flap is lowered. This "gate" serves as a guide vane to direct air in toward the slot between the flap and the wing, and so increases both the velocity and quantity of air passing through the slot.

Martin Flaps

There should be a brief explanation of the Martin-Grant flap usage on the 4-0-4. Two Martin engineers, James Bennett and James Webb, sketched their flap ideas in July 1945, and filed patent applications for the double-slotted flaps on the 4-0-4 in August 1947.

The Patent Office ruled an interference between their patent application and one of Grant's filed in April 1945. Invention was recognized in each application, and patents were awarded to both Martin engineers and Grant.

A Martin spokesman had this to say in correspondence with Grant: "The Patent Office interference settled that you were the first inventor and we have accepted a license under the dominating patents."

Grant believes that the outstanding performance of the flap design on the 4-0-4—praised highly by the Air Line Pilots Assn. in its pilot-team evaluation of the Martin transport before it went into service—is a proof of the basic soundness of his ideas.—DAA

INDIANA GEAR

Aircraft specialists in...

GEAR SHAPING
GEAR GRINDING
GEAR CUTTING
GEAR HOBBING
DRILL PRESS (RADIAL & POWER FED)
HORIZONTAL BORING
BROACHING
INTERNAL GRINDING
EXTERNAL GRINDING
LATHE WORK (TURRET & ENGINE)
HEAT TREATING
METALLURGY
ROTOBLAST
GUN DRILLING
MILLING
TAPPING
NITAL ETCH
AF APPROVED INSPECTION
ZYGLO
MAGNAFLUX
X-RAY EXAMINING
PARKO LUBRIZE
DICHROMATE
DULITE
COPPERPLATE
CADMIUM PLATE
VAPORBLAST
SPRAY PAINTING & BAKING
ASSEMBLY
DESIGN ENGINEERING

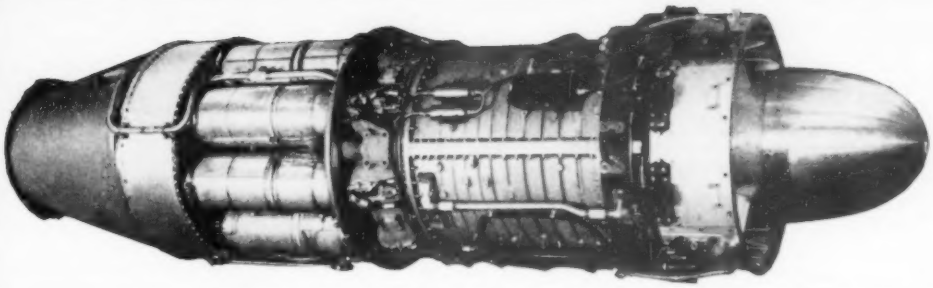
Our complete facilities brochure available on request

INDIANA GEAR

INDIANA GEAR WORKS, INC., INDIANAPOLIS 7, IND.

RUGGED OPERATING CONDITIONS in Korea proved stamina of G-E J47 engines installed in North American Aviation F-86 Sabre Jets. Korean combat data also helped G-E engineers increase J47 service life approximately twenty-five percent.

ALLOWABLE TIME-BETWEEN-OVERHAULS ON G-E J47's HAS GROWN STEADILY HIGHER



1954
J47 JET ENGINE

Vital to S.A.C. B-47's and B-36's, the J47's allowable operating time between overhauls has increased to 1200 hours over the past six years.

Why G.E.-jet powered aircraft today fly
FARTHER BETWEEN ENGINE OVERHAULS

Continuing improvement program delivers "more jet engine" per Air Force dollar . . . Here's how—

By applying past manufacturing experience and laboratory studies, test cell reports and operational data, G.E. has increased the allowable operating time between overhauls of its J47 engines from 15 hours in 1948 to 1200 hours (W.M.R.*) in 1954. As a direct result. . .

1. The Air Force now realizes huge savings in J47 overhaul and procurement costs. Estimated savings on the J47-25 alone: $100,000,000.

2. Availability of G.E.-powered aircraft at U.S.A.F. bases is increased. A S.A.C. B-47 recently logged more than 600 hours without a single engine change.

Actually, all the reasons behind the tremendously successful J47 engine program come down to one: General Electric's jet engineers constantly seek rock-hard facts on how to improve G-E engines—then put the facts to work. Three thousand design improvements have been made in the J47 since 1948. New compressor blades withstand vibration better and give increased engine life. Ceramic-coated inner liners have replaced ordinary metal liners for longer operating life.

Add the J47's anti-iced "hot nose" which protects the compressor from ice particles . . . its new cross-fire tubes . . . new exit rings . . . floating turbine shroud, new transition liners, channel-fairing tailcones, curvic-coupling rotors, re-designed water nozzles—these and hundreds of other improvements make up the reason why G.E.-jet powered aircraft today fly farther between engine overhauls.

And progress like this illustrates why G.E. remains the world's largest producer of jet engines. *Section 230-22, General Electric Company, Schenectady 5, N. Y.*

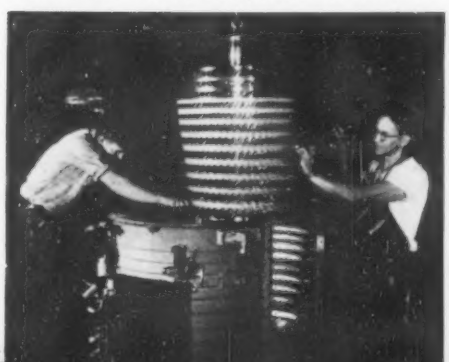
*With Minor Repair.

Progress is our most important product

GENERAL ELECTRIC

CERAMIC-COATED LINER developed by G.E. increases operating life of G-E engine combustion chambers, permits higher temperatures.

LATEST ASSEMBLY METHODS assure precision alignments necessary for maximum engine life, yet bring new turbojets off production lines faster.

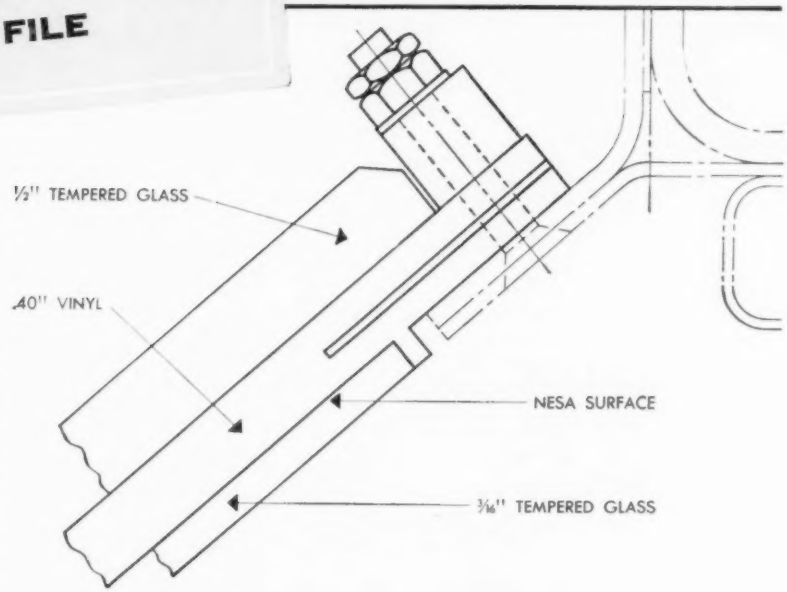


CLOSE QUALITY CONTROL to maintain exact tolerances of component parts is another reason G-E jets fly farther between engine overhauls.

Electrically-heated "NESA" glass solves problems of visibility and pressurization for boom operator in Boeing's Aerial Tanker

A report from

THE PITTSBURGH AIRCRAFT GLAZING FILE



A KEY factor in high altitude refueling from Boeing's KC-97 aerial tanker is good visibility at all times for the boom operator. A big 31" x 31" window of electrically-heated "NESA" glass assures this kind of visibility and handles the pressurization problems at all times.

The window consists of two sheets of tempered glass with a vinyl filler between. Because of the extreme size of the window, Boeing engineers felt it was absolutely essential that the vinyl layer hold the pressurization load if the glass should break. The vinyl used is .40" thick and the inboard layer of glass is ½" thick, making both elements the strongest of their kind used in aircraft.

The "NESA" coating conducts electrical current over the glass area, preventing fogging and icing and maintaining clear visibility. The same Flexseal type of "NESA" glass is used in the seven panels comprising the windshield area.

The accompanying detail shows a cross section of the lower edge of this large window with the vinyl insert protruding from the two lights of glass to give a flexible, sealed connection with the fuselage. This lower edge is beveled to give better clearance in installing the large glass.

Pittsburgh Plate Glass Company technical representatives assisted Boeing engineers in designing this installation. You can take advantage of this same kind of assistance with your problem, drawing upon the wide experience of Pittsburgh representatives and the broad selection of glazing materials available to them. For complete information, write to Pittsburgh Plate Glass Company, Room 4228, 632 Fort Duquesne Blvd., Pittsburgh 22, Pa.

PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS · FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

J&H Breaks Short-Run Production Jam

• Special setup for small orders makes use of tooling shortcuts to speed delivery time and slash costs.

Short runs can play hob with a production shop, raising costs and reducing plant efficiency.

Jack & Heintz has come up with one satisfactory answer to this problem—a special short-order department. Set up about a year ago by the Cleveland manufacturer, this production setup is lopping off about 30% in delivery time and thousands of dollars in tooling costs on orders for 10 or fewer aircraft equipment units.

► **Still Young**—It was put into operation because it became evident to J&H management that the trend in the aircraft industry was away from high-volume production toward smaller orders for development work. Also, prime contractors wanted faster delivery than the usual nine to 12 months.

Now, the department has 34 production and 11 salaried employes, is turning out about 70 units per month with a dollar volume of about $70,000. Eventually, the department will expand to 100 employes and triple its current monthly volume, manager Ambrose Recker believes.

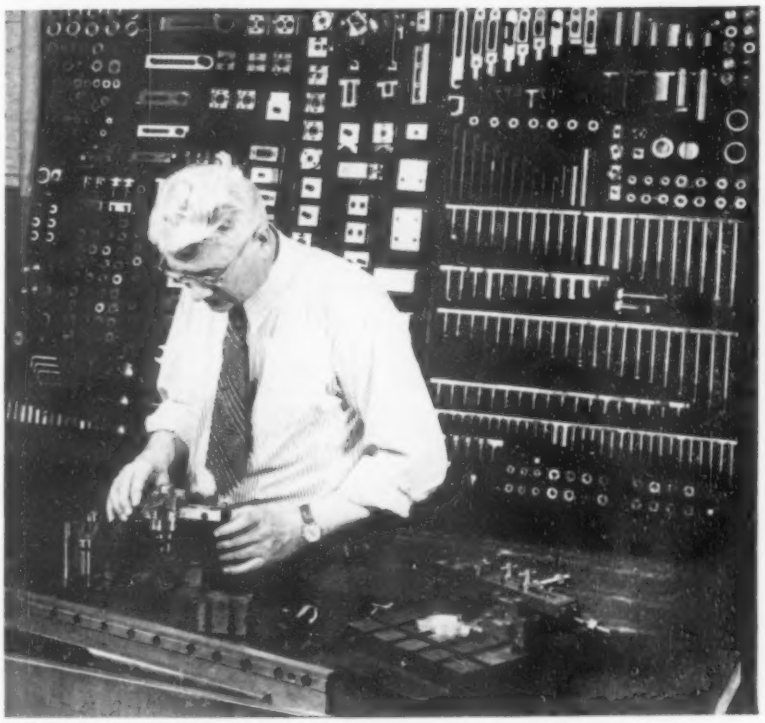
► **Short Cuts**—Space for the new department was found in a portion of Plant No. 1, about five miles from the main plant, but next door to the engineering department, with which the short order setup must maintain close contact.

Machines have been installed for almost every phase of production except gear cutting, plating, punch press work and testing, which are handled quickly in the main plant, Recker says.

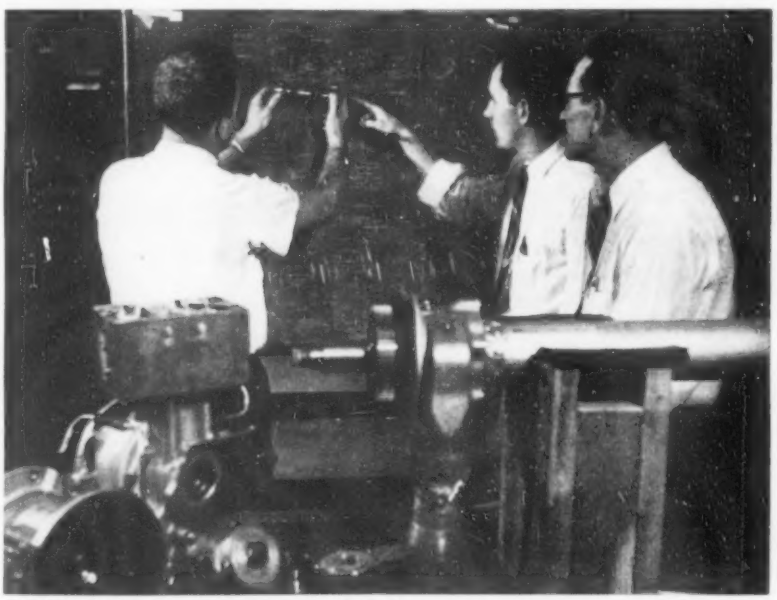
Short cuts made possible with the new setup range from slashing paper work to the bone to using temporary production tooling.

For example, on a particular order for seven units, production tooling would cost $80,000, while the temporary tooling used in the short order department costs only about $5,000. This is a typical case, Recker says, since average tooling costs for volume production will run to $60,000-$70,000, while the temporary tooling costs between $3,000 and $5,000.

► **Universal Setup**—One reason for the lower tooling costs is the use of the



PROCESS ENGINEER, assembles fixture, using parts from Wharton board seen in background. With this system, J&H production men can set up tooling quickly, disassemble it fast when job is over.



SHORT-ORDER department personnel check part against customer's marked-up drawing. Instead of taking time to make detailed drawings in accordance with regular engineering routine, Short Order works direct from drawings such as these.

Wharton Universal Jig and Fixture System—a British development introduced in this country a few years ago. The Wharton board contains all the components required to assemble jigs and fixtures.

A skilled toolmaker can assembly a simple tool from its parts in a few hours. When the jig or fixture has served its purpose, it can be disassembled quickly.

With big-volume tooling, it is possible to clamp a piece in a fixture more rapidly, but the few seconds saved is not important when only five or six pieces are being made, Recker says.

▶**Skilled Team**—He has a crew of skilled general machinists picked from the J&H factory. Because these men are familiar with all kinds of machines, scheduling is speedy and flexible.

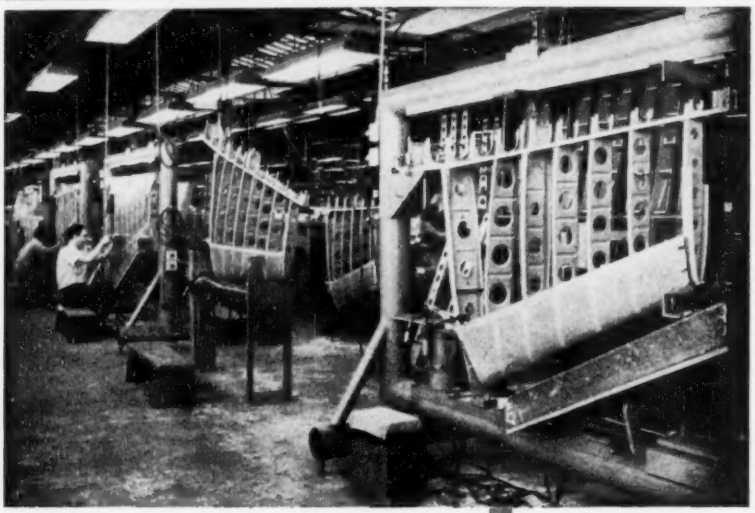
The short-order department doesn't take the time to translate a customer's drawing into the usual detailed J&H drawings. Its production employes work from a customer's marked-up print as well as from an engineering or production drawing.

A liaison man from the engineering department works closely with the short order activity on changes. When a change is requested, the liaison man writes it out in longhand, shoots it to the short-order department. It is tacked to the drawing and is made quickly.

About two weeks later, following the usual routine, the formal change notice is received. By that time, though, the change already has been made by the department.

▶**No Material Delay**—Materials are obtained through the J&H purchasing department on order from its production chief. Although the short-order department has to pay more because it is not ordering in quantity, delivery is faster, Recker claims.

Cost accounting in the department is simplified, too. All work done on a unit is charged directly to the order number instead of the usual routine of charging to a part number.



Above F-84 fins and rudders by EDO

Edo means more than PRECISION WORKMANSHIP

EDO Means *Design*, Too. Water plays no favors. Water leaks through any structure not precisely built. That's why making seaplane floats for 27 years has made precision manufacture of aluminum components a specialty at EDO.

Because of this unusual metal-working know-how, many manufacturers are turning their hard-to-make parts and sub-assembly problems over to EDO.

What's more, EDO's vast engineering staff, which has designed everything from complete aircraft to the Navy's latest sonar equipment can tackle problems right from the design stage, if desired.

Perhaps EDO can help you.

A FEW EXAMPLES OF EDO CRAFTSMANSHIP

Famous EDO Seaplane Floats

USAF A-3 airborne lifeboat

Precision Radar Reflector

Electronic Cabinet

Edo CORPORATION

Since 1925 COLLEGE POINT, NEW YORK

New Inventions

Government Offers Patents for License

New patents issued recently on inventions assigned to the U. S. in the field of aircraft and parts have been reported to AVIATION WEEK by the Government Patents Board.

These inventions are available for license, ordinarily on a non-exclusive royalty-free basis, on application to the agency indicated in the abstract. Printed copies of letters patent may be obtained from the Commissioner of Patents, Washington 25, D. C., at 25 cents a copy, payable by check or money order (stamps not accepted). Specify patent number and title when ordering.

▶**HERMETICALLY SEALED EXPLOSIVE CARTRIDGE. Patent No. 2,667,837, issued Feb. 2, 1954.**

An explosive cartridge for use in the catapults of aircraft ejection seats comprises a cylindrical casing having a retaining plate in the head, a hammer, a percussion primer, radial fire holes and a booster charge. The casing is sealed by turning over the rim against a resilient rubber ring to render the seal waterproof and airtight. Inventors: C. Walton Musser and Norman K. Turnbull. Administered by the Office of the Judge Advocate General, Department of the Army, Washington 25, D. C.

▶**MINIATURE ELECTRON TUBE STAGE ASSEMBLY. Patent No. 2,668,-933, issued Feb. 9, 1954.**

A miniature electron tube assembly for use in aircraft circuits comprises a U-shaped metal holder on which cylindrical resistors, capacitors and inductors are mounted in aligned positions in the enclosed corners of the holder. The holder has a spring clip fixed thereon adapted to embrace a miniature electron tube. The edges of the lower portions of the holder are bent inwardly to hold a transformer below the tube. Inventor: Gustave Shapiro. Administered by Patent Counsel, Department of the Navy, Washington 25, D. C.

"O. K. To Jettison!"

The force ejection pylon designed, developed, and produced by Pastushin assures safe, positive ejection of jettisonable fuel tanks and other external stores at any speed or possible flight attitude.

Engineers! If you are not now employed in defense production, submit resume.

PASTUSHIN AVIATION CORPORATION • Los Angeles, California

DESIGN • RESEARCH • DEVELOPMENT • PRODUCTION

Save ⅔ of your Wire Twisting Costs with ROBINSON WIRE TWISTERS

Manufacturers, sub-assembly plants, airlines, military bases, research, and overhaul organizations all over the world are now safety wiring 3 engines, with the split-second whirling action of the Robinson Wire Twister, in the time required for one by any other method. Savings up to $140 per engine are enough to pay for 8 twisters. 3-tools-in-1: pliers, cutters, twister. 12" and 9" length. $19.50 ea.—$18.50 ea. in doz. FOB Sacramento. *Unconditionally guaranteed.* Write for details.

RALPH C. ROBINSON CO.
Box 494-425
North Sacramento 15, Calif.

CHECK LIST

POROUS STAINLESS STEEL

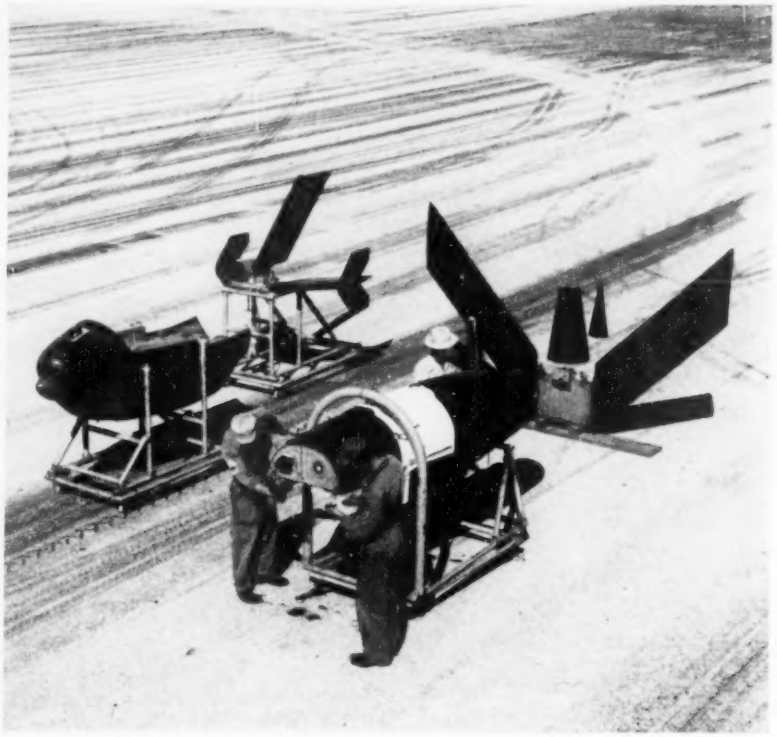
for

- ☑ Boundary Layer Control
- ☑ De-Icing
- ☑ Transpiration Cooling
- ☑ Hydraulic Filters
- ☑ Instrument Breather Vents
- ☑ Fuel Filters

Engineering data 70A sent on request

Aircraft Porous Media, Inc.
51-F Sea Cliff Ave. PALL Glen Cove, N. Y.

The Pall Filtration Companies
Micro Metallic Corporation | Porous Plastic Filter Company | Aircraft Porous Media, Inc.



FIVE MAJOR SECTIONS, easily assembled, comprise Ryan's pilotless Firebee.

Fast Field Maintenance Built Into Firebee Jet-Powered Target Drone

How simply can a rugged, recoverable, jet-powered target drone be built?

One answer has been supplied by Ryan Aeronautical Co. with its high-speed, high-altitude Firebee, designed for anti-aircraft and aerial gunnery training, combat plane interception work, and guided missile target jobs by Air Force, Navy and Army.

▶ **Single Large Assemblies**—Aimed at fast assembly in the field and ease of maintenance, the 1,800-lb. airframe has a 12-ft. span, 18-ft. length, 6-ft. height. Following a simplified design and production scheme, the aircraft is constructed in five major assemblies embodying four-point attachments and self-aligning bolts. This major breakdown—fuselage, nacelle, wing, empennage, and tailcone—permits shipment of the complete target in five containers for a total weight of about 2,500 lb.

In the field, the drone can be locked together in slightly more than an hour by two or three men aided by some handling equipment.

▶ **Nacelle Hookup**—The Firebee airframe includes applications of aluminum, magnesium and stainless steel. Fuselage is a semi-monocoque structure using magnesium and stainless steel skins, aluminum alloy longerons and magnesium and aluminum frames.

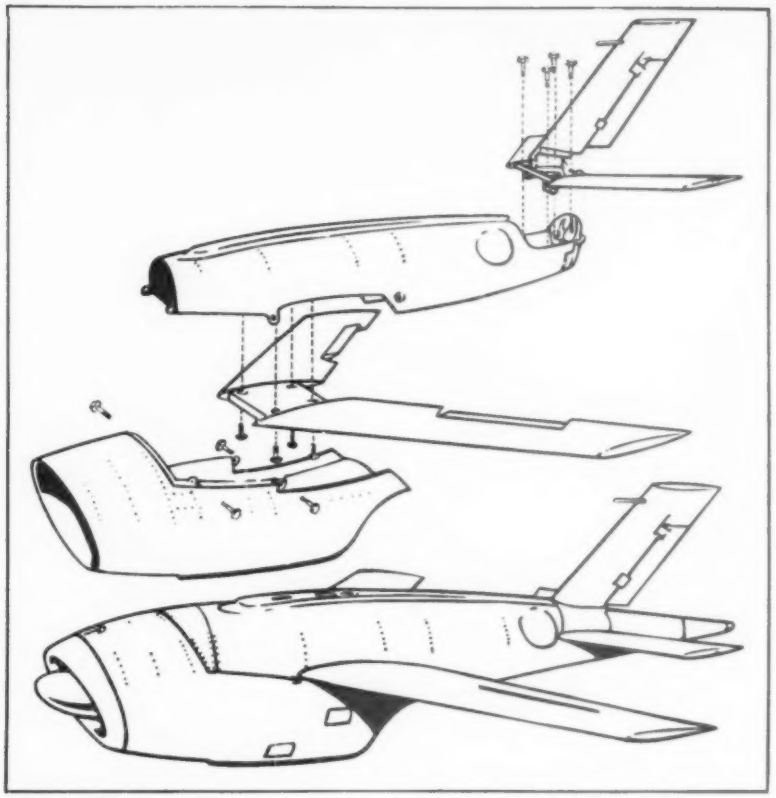
Lower forward section of the fuselage hooks on to the nacelle, which houses the turbojet and its accessories. Fuselage-nacelle attachment is via four points, with the two forward fittings acting as hinges to allow easy access to the engine without need for removing nacelle from the fuselage.

Nacelle is made up of magnesium skin over aluminum alloy frames and longerons. Stainless steel is used in areas subjected to engine heat. Complete with its turbojet, the nacelle weighs only about 500 lb.

▶ **Wing Assembly**—Another major assembly is the wing, a single unit comprised of a center and two outer panels fabricated from heavy gage aluminum alloy skin over three aluminum alloy spars. There are no ribs except at the root and tip stations.

The light-gage magnesium wingtips are piano-hinged to the outer panels to provide for easy replacement in the event of damage from parachute drop.

▶ **Tail Unit**—Vertical and horizontal stabilizers are fabricated as a single assembly, with magnesium skin covering



BREAKDOWN shows how bolts at four-point attachments hold Firebee together.

TECHNICIAN ADJUSTS nylon riser to which recovery parachute will be attached.

TO THE

E. E.

OR

PHYSICS

GRADUATE

WITH EXPERIENCE IN

RADAR

OR

ELECTRONICS

HUGHES RESEARCH AND DEVELOPMENT LABORATORIES ARE ENGAGED IN A CONTINUING PROGRAM FOR DESIGN AND MANUFACTURE OF ADVANCED RADAR AND FIRE CONTROL SYSTEMS IN MILITARY ALL-WEATHER FIGHTERS AND INTERCEPTORS.

THE GREATEST advancements in electronics are being made in this sphere because of military emphasis. Men now under 35 years of age will find this activity can fit them for future application of highly advanced electronic equipment.

YOU WILL serve as technical advisor in the field to companies and government agencies using Hughes equipment.

TO BROADEN your field of experience in radar and electronics you will receive additional training at full pay in the Laboratories to become thoroughly familiar with Hughes radar and fire control equipment.

AFTER TRAINING you will be the Hughes representative at a company where our equipment is installed; or you will advise in the operation of Hughes equipment at a military base. (Overseas assignments, single men only.)

HUGHES

RESEARCH AND DEVELOPMENT LABORATORIES

SCIENTIFIC AND ENGINEERING STAFF

Culver City, Los Angeles County, Calif.

Assurance is required that relocation of the applicant will not cause disruption of an urgent military project.

Spring is machined from solid bar stock to assure accuracy and stability.

Parker announces new

Provides excellent atomization . . . quick starts . . . even operates with contaminated fuel

"Look at this spray pattern of fine, evenly distributed fuel particles. It is produced by an entirely new type of fuel nozzle", reports S. A. Rogers, Manager of Parker's Engine Accessories Division.

"Using a single inlet holder, this new nozzle provides a more compact and lighter installation. Outside shape and size of the nozzle body can be furnished to customers' requirements.

"A unique design feature permits this nozzle to operate under contaminated fuel conditions.

"Quick starts are facilitated by maintaining full fuel manifold. Positive starts have been achieved at as low as 3% of rated engine r.p.m. High altitude starts can be made over a much broader range of fuel/air ratios.

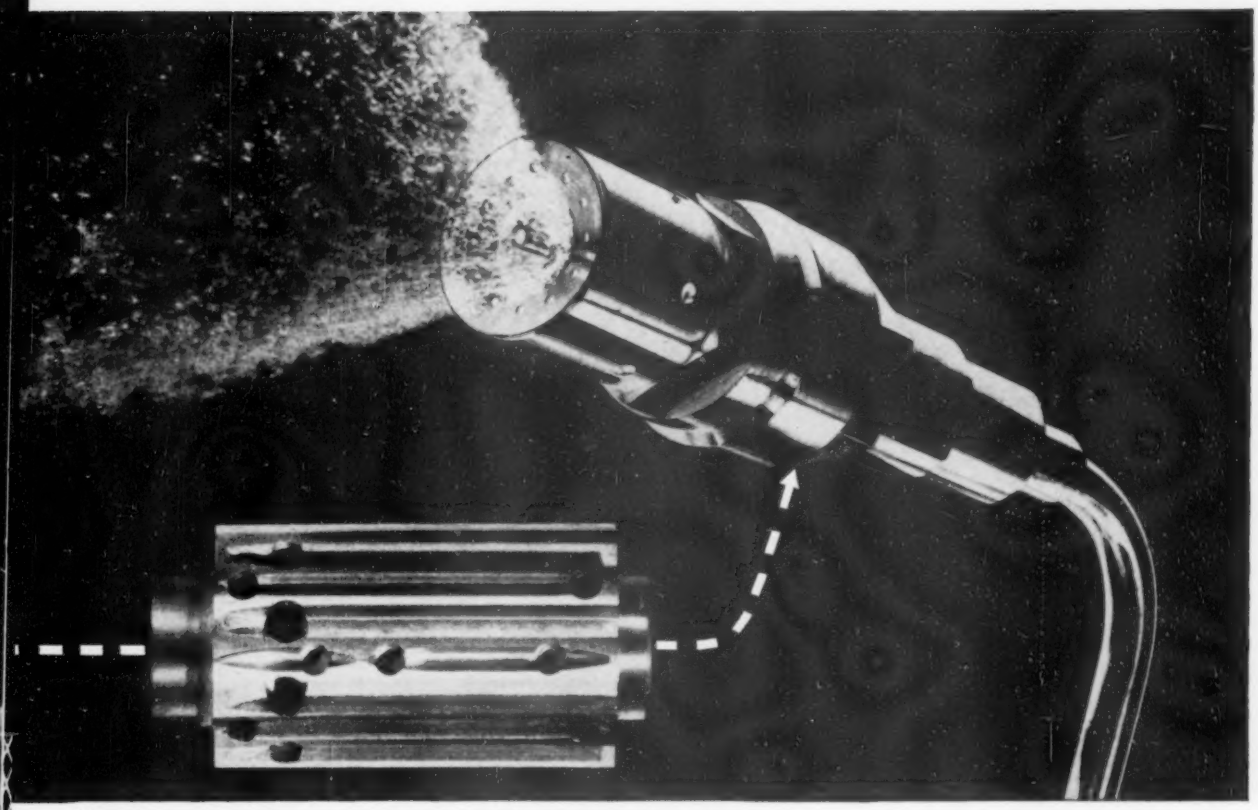
"Accurate nozzle metering eliminates any need for expensive fuel system flow dividers. Dispersion of burner temperatures is greatly reduced.

"This new nozzle provides excellent atomization over an extremely wide flow range, yet operates at low fuel line pressures. No appreciable change in atomization is experienced with JP-4 fuel at — 65° F. (20 centistokes viscosity). Spray quality as well as penetration can be tailored, over a broad range, to meet customer requirements. You may have a variety of spray sheaves, shapes, and angles. Also specific fuel consumption at high altitudes is substantially less.

"We invite inquiries. Why not contact us today?"

ENGINE ACCESSORIES DIVISION
The Parker Appliance Company
17325 Euclid Avenue, Cleveland 12, Ohio

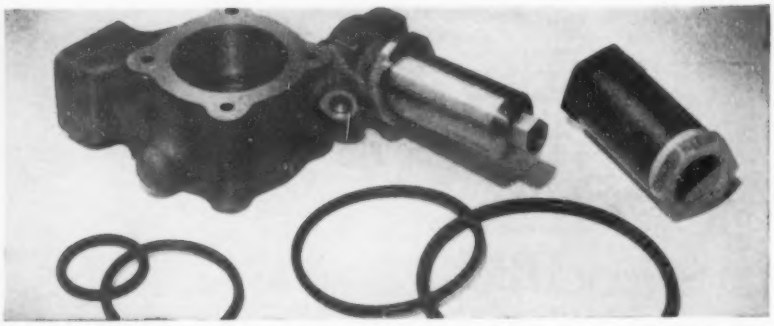
Parker
Hydraulic and fluid system components



Liner houses all moving parts. Fuel flows through grooves to spin section.

variable-area fuel nozzle

Nozzle spray tests enable engineer to check fuel flow versus pressure drop. Fundamental research over many years was needed to make this brand new nozzle possible.



Other Parker products: Butterfly and check valves represent accessories for engine *hot-air* and *hydraulic* systems. Parker O-rings are approved for all military applications.

ENGINE ACCESSORIES DIVISION
The Parker Appliance Company
Section 303-C
17325 Euclid Avenue
Cleveland 12, Ohio

☐ Please send me your new 24-page booklet about all types of Parker engine accessories, Bulletin 1330B1.
☐ O-ring catalog No. 5100.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

STATE _____ CITY _____

The Saving Touch

cuts typing costs

the new

IBM
TRADE MARK

electric typewriter

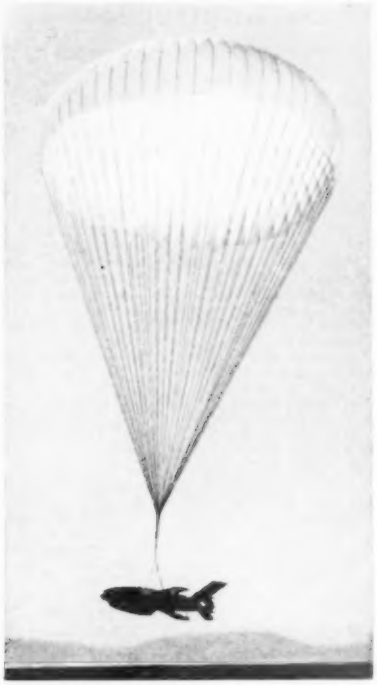
The wear-and-tear you save your typists when you switch from manual typewriters to fast IBM Electrics means big dollar savings to *you*.

Actually, IBM's easy, fingertip touch and electric control greatly increase typing production through saving 95.4 per cent of the energy required to operate a manual typewriter. *A whole hour's typing on an IBM requires less energy than 3 minutes on a manual!**

Add to this the benefits of finer-looking work, better morale among your staff, greater prestige among your customers, and it's easy to see why business firms have bought more than 3 times as many IBM's as all other models of electric typewriters combined!

For full information, write Dept. **AW-1**, International Business Machines, 590 Madison Ave., New York 22, N. Y.

*By actual mechanical measurements, of inch ounces of energy for key, space bar and carriage return operations.



INTACT RECOVERY is assured by chute.

aluminum alloy spars. Ribs are used only at the tip. The vertical fin has a removable tip above the rudder, which is attached to the fin with a pair of piano hinges.

The empennage is installed without the need for any handling equipment. Only four bolts are required.

Tailcone is a two-section housing accommodating the parachutes that are used in recovery of the drone. Installation of the tailcone plus a few small fairings complete the assembly.

▶ **Production Contract**—First contract for the production of the Firebee was placed last year. The craft first flew in 1951, has been launched from the ground with both rail and zero-length techniques and from the belly and wings of mother aircraft.

Currently it is being used in two separate test programs at Holloman Air Development Center. The Ryan test group's research and development program is nearing completion, while the drone has entered a new phase—operational suitability testing. This is being conducted by an AF operational test center group from the Air Probing Ground Command (AVIATION WEEK Mar. 1, p. 29).

▶ **Two Engines**—The Fairchild 1,000-lb.-thrust J44 turbojet has powered the drone in most of its flights, but the craft also has been tested with the J-69 Marbore turbojet.

Continental Aviation and Engineering Corp. has been awarded a production contract to produce the J69 for the Ryan drones. —Irving Stone

PRODUCTION BRIEFING

▶ **Clary Multiplier Corp.**, San Gabriel, Calif., is producing a new guided missile component and is enlarging manufacturing facilities to handle the new contract. The firm's Instrument Division has a $4-million backlog for products such as gyroscopes and servomechanism components.

▶ **Lockheed Aircraft Service**, N. Y., has received a contract to overhaul 35 Convair T-29 twin-engine navigational trainers for USAF. The New York base also recently received an award from Republic Aviation Corp., N. Y., for installation of Westinghouse E-9 autopilots in an undisclosed number of F-84F jet fighters with work to be completed in early August.

▶ **Solar Aircraft Co.**, San Diego, Calif., has received a contract exceeding $6.6 million from Ford Motor Co.'s Aircraft Engine Division covering J57 jet engine components. Work includes case assemblies and major "hot end" parts and is in addition to previous J57 orders Solar has received from Ford and Pratt & Whitney Aircraft.

▶ **Douglas Aircraft Co.'s** Santa Monica Division has been assigned major assembly work on the A3D Skywarrior twin-jet Navy bomber being produced by the company's El Segundo Division. Eventually Santa Monica will handle planning, tooling, fabrication, assembly and installation of 20% of the A3D and will utilize 450 workers and some 45,000 sq. ft. of floor space.

▶ **B. H. Aircraft Co., Inc.**, Farmingdale, N. Y., has added a new building of more than 10,000-sq. ft. floor space for manufacture of propeller and engine components.

▶ **William Thomas & Sons, Inc.**, contract manufacturers of small metal parts and assemblies, has moved to a larger plant at Slocum Ave., Ridgefield, N. J.

Watch that Passenger

on page 63

LEWIS
Thermocouples

Iron-Constantan
Copper-Constantan
Chromel-Alumel

FOR MEASURING TEMPERATURES IN AIRCRAFT

AN5540-1 18 MM. iron-constantan Sparkplug-gasket type thermocouple for measuring cylinder-head temperatures. Also available in copper-constantan and in 14 MM size for either material.

AN5540-2 Iron Constantan Sparkplug-gasket type with copper ring for 18 MM plugs. Wire guard and supporting bracket are stainless steel and conductors are protected with flexible heat-resistant sleeving. AN5539 terminals are silver-soldered to leads.

AN5541-1 Iron Constantan Bayonet Type thermocouple with junction located in silver tip. Spring used with this thermocouple will retain its strength despite high temperatures.

AN5545-1 Chromel-Alumel Tailpipe Thermocouple. Insulated with a temperature-resistant ceramic and overbraided with stainless steel wire, this thermocouple is built to withstand severe jet engine service.

We invite inquiries on your temperature measuring problems.

THE LEWIS ENGINEERING CO.

Manufacturers of Complete Temperature Measuring Systems for Aircraft

NAUGATUCK, CONNECTICUT

FLY with CONFIDENCE

...behind a constant-speed Airliner Met-L-Matic propeller by McCAULEY

From hub to tips the new Met-L-Matic propeller is engineered to put confidence into your flight. Available for 0470 Series engines, feathering and non-feathering models. Check its outstanding features and make it a must to fly behind an Airliner Met-L-Matic at your first opportunity. *Like riding on a cloud!*

✔ Check these features

Sealed-in, factory-lubricated, pitch-changing mechanism.

No pitch-changing parts exposed to weather.

Hydraulically operated. Holds RPM accurately without wavering or surging.

Forged Aluminum Alloy hub and blades for high strength—low weight.

Better Design Means Minimum Maintenance and Lower Operational Cost.

McCAULEY INDUSTRIAL CORPORATION
1840 HOWELL AVE.
DAYTON 7, OHIO

MET-L-MATIC FORGED STRENGTH

"World's largest maker of metal propellers for personal and business aircraft . . . more than 40,000 Met-L-Props, and now the new Met-L-Matic."

BUILT TO SERVE YOU

Write Department WS for free 110 page catalog

CAWLEY AIRCRAFT Supply Company now occupies a new expansive structure designed with you our customer in mind. Because these new facilities have enabled us to expand our manufacturing, warehousing and distributing operations we are now able to offer our customers more efficient service and a much more complete stock of the aircraft materials you need.

Production control and inspection guarantees quality. Dealing with one of America's most reliable aircraft material manufacturers and suppliers assures you of delivery when you need it.

Whether you need one piece or a million draw from one of the largest stocks in the East. Phone, wire or write

AN and NAS HARDWARE
HYDRAULIC FITTINGS
ELECTRICAL FITTINGS
SWITCHES
LAMPS + VALVES
ELECTRICAL TERMINALS
ELECTRICAL WIRE and CABLE
AN SIX DIGIT and MS PARTS
HOSE and HOSE ASSEMBLIES
AN TEMPERATURE BULBS
SPECIAL MACHINED PARTS TO YOUR DRAWINGS

CAWLEY AIRCRAFT SUPPLY CO., INC.
NOW AT: 151-04 TWELFTH AVE., WHITESTONE, L. I., N. Y.
FLushing 3-2000

Remember: CALL ON CAWLEY—"FOR QUALITY" • CALL ON CAWLEY—"FOR SERVICE"

Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

Aerod Co., Inc., 1731 Workman St., Los Angeles 31, wheel assys., solid tail, 2,359 ea., $58,857.

Airite Products Inc., 3528 Union Pacific Ave., Los Angeles, 23, switches, $84,876.

Bendix Products Div., Bendix Aviation Corp., 401 Bendix Drive, South Bend 20, Ind., seat, diaphragm, valve and two items of engine parts, $60,835; cylinder assy., inner cylinder, and 201 items of shock, strut parts, $654,836; carburetor assy., 333 ea., $353,780; shock strut and maintenance parts for UF-1 aircraft, $72,941; carburetor assys., $113,715.

Bristol Co., Aircraft Equip. Div., Waterbury 20, Conn., control, including spare parts, 187 ea., $84,886.

Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., amplifier and spare parts, $121,198; post and cover assys., holder and armature, $27,101.

Firestone Tire and Rubber Co., 1200 Firestone Parkway, Akron 17, 13 items for tires and tubes, $404,030.

General Electric Co., 1405 Locust St., Philadelphia 2, Pa., bearings, $115,427.

General Materials Co., Div. of Crosby Products Corp., 4 Water St., Brooklyn 1, N. Y., aluminum alloy sheets, $31,449.

General Tire Rubber Co., Akron 17, 14 items for tires and tubes, $389,835.

B. F. Goodrich Co., 1112 Nineteenth St., N.W., Washington 6, D.C., 16 items for tires and tubes, $398,494.

Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron 16, 19 items for tires and tubes, $455,019.

Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn., valve assy., 2,000 ea., $90,000.

BuAer Contracts

The following contract awards of $25,000 and more have been announced recently by the Bureau of Aeronautics, Department of the Navy, Washington 25, D. C.

DOUGLAS AIRCRAFT CO., INC., El Segundo, Calif., kits of parts (V&V1) for addition of armor plate on Model AD-2 aircraft, 162 ea., $224,358; kits of parts, spoiler control valve, for Model F3D aircraft, 214 ea., $28,252.

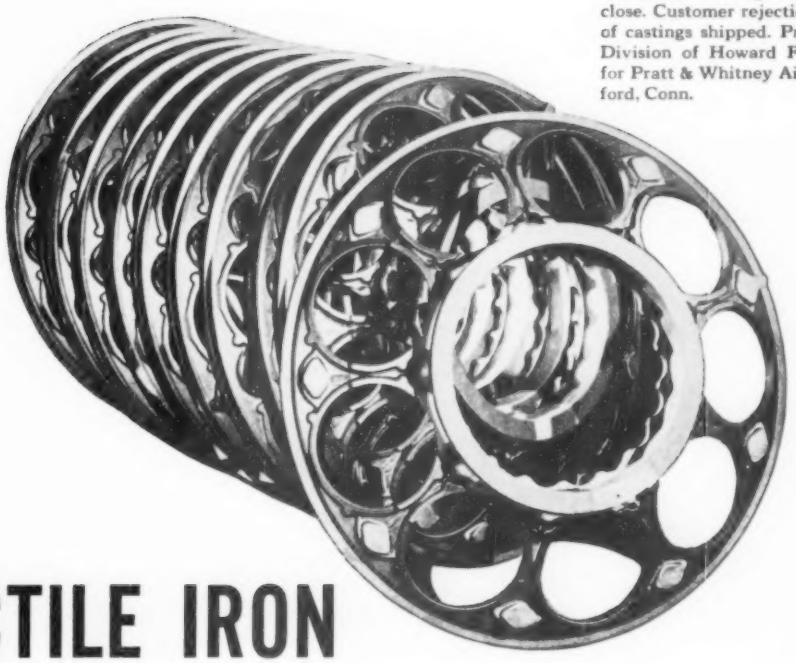
ENGINEERING AND RESEARCH CORP., Riverdale, Md., kit A, Aero 14B rocket launcher, 12,000 ea., kit B, Aero 14B rocket launcher, 3,000 ea., $701,250.

JAM HANDY ORGANIZATION, INC., Detroit 11, preparation of master shooting scripts with partial storyboards and production of (8) motion picture training films on the general subject of "Replenishment at Sea," to be entitled : (a) "Fueling at Sea—Oiler Inhaul Method," 1,350 ft., (b) "Fueling at Sea—Spanwise and Modified." 1,350 ft., (c) "Fueling at Sea—Close-in Method," 1350 ft., (d) "Fueling At Sea—Astern Method", 1,350 ft., (e) "Transfer of Stores—Highline Methods," 1,350 ft. (f) "Transfer of Stores—Burton Method," 1,350 ft. (g) "Transfer of Stores—Housefall Method," 1,350 ft., (h) "Transfer of Stores—Very Heavy Unit Transfers," 1,350 ft., $38,788.

LEAR, INC., Grand Rapids, Mich., analysis of methods for effecting the transmission of data from the rotor of a helicopter to the fuselage; analysis of methods for determining the pitch and roll attitudes of the tip-path plane of a helicopter rotor; fabrication of a breadboard type model of the optimum data transmission system evolving from the first-mentioned analysis; reports, final and progress, $29,805.

MINNEAPOLIS-HONEYWELL REGULATOR CO., Minneapolis, design, develop, construct, test and furnish an all-attitude fuel gage system, reports, drawings, $69,280.

Intricate Castings of Ductile Iron . . . Produced in Quantity . . . meet jet plane builder's specifications for engine support rings, 37¼" in diameter. Sections vary from a thin ⅜" to a thick 2" in the as-cast state, and conform to high radiographic standards. Casting tolerances are exceptionally close. Customer rejections averaged less than 2% of castings shipped. Produced by the Semi-Steel Division of Howard Foundry Co., Chicago, Ill., for Pratt & Whitney Aircraft Division, East Hartford, Conn.



DUCTILE IRON

meets quality standards for jet engine burner supports

- 108,000 psi. ultimate tensile strength
- 72,000 psi. yield strength
- 5% elongation

These averages . . . from 100 consecutive ¾-ton heats of Ductile Iron, as cast . . . demonstrate consistently high mechanical properties.

Remarkable load-carrying ability, combined with unusual fluidity and castability, makes Ductile Iron ideal for intricate, accurate, high strength castings.

Annealed Ductile Iron can be machined at a rate 2 to 3 times that of good quality gray iron of comparable strength. Parts cast in Ductile Iron provide superior pressure tightness, elastic modulus and resistance to shock. They can be readily welded. Sections may range from as thin as one-tenth of an inch to 4 feet in thickness.

Send us details of your prospective uses, so that we may offer a list of sources from some 100 authorized foundries now producing Ductile Iron under patent licenses. Request a list of available publications on Ductile Iron . . . mail the coupon now.

INCO

The International Nickel Company, Inc.
Dept. 20, 67 Wall Street
New York 5, N. Y.

Please send me a list of publications on: DUCTILE IRON

Name _____ Title _____

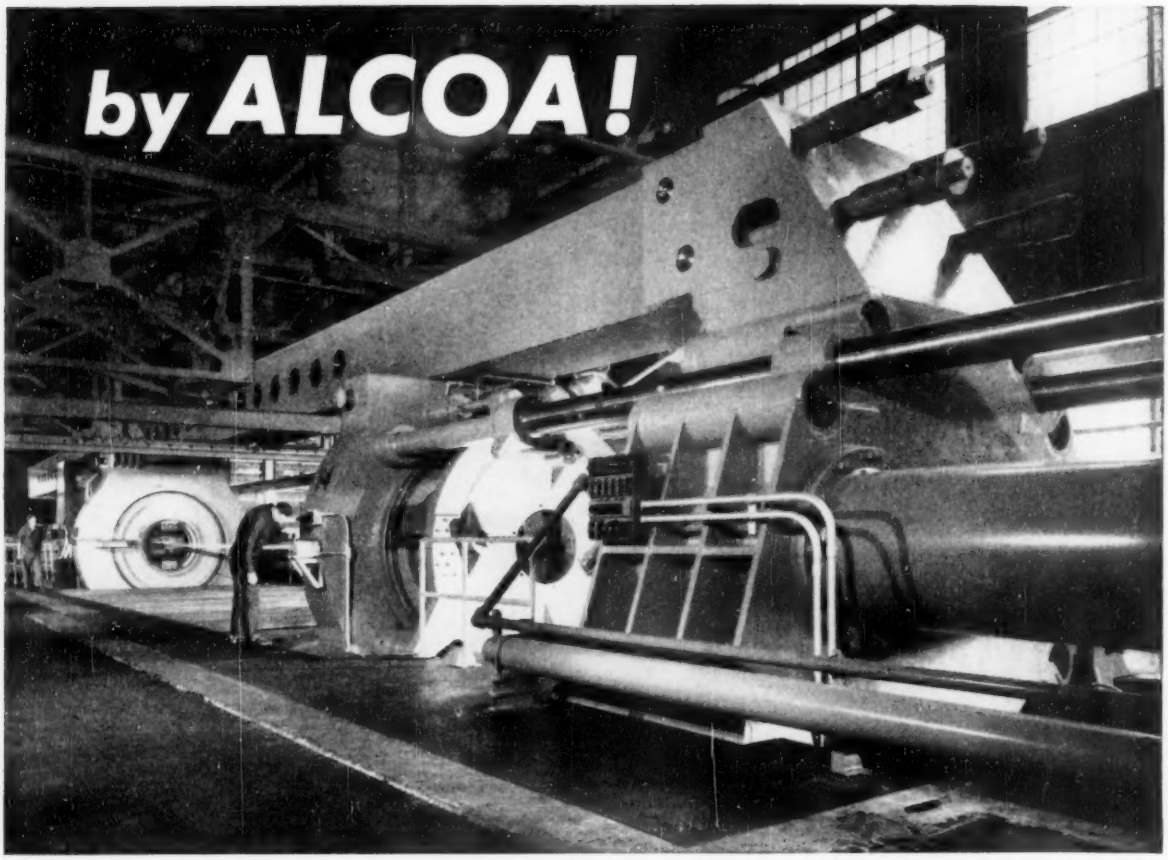
Company _____

Address _____

City _____ State _____

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

STRETCHED



During the quenching process, large extruded shapes have a tendency to warp and curve, and acquire internal stresses, resulting from the sudden cooling. The shapes must be straightened and the internal stresses minimized.

Alcoa does this with a three-million-pound stretcher!

It has to be big to handle the giant extruded shapes needed to cut aircraft assembly time. But it's NOT so large that the people who operate it lose their identity. These people are part of a closely knit team, drawing on Alcoa's 66 years of experience in aluminum.

Extrusion stretching is just a part of the extra something which Alcoa puts into each product. Because every Alcoa® Forging, Casting, Rolled Form, Extruded Shape . . . every piece of sheet or wire has Alcoa's team spirit behind it. Your local Alcoa sales office is your short cut to this experience—and the number is listed under "Aluminum" in the classified section of your telephone directory. ALUMINUM COMPANY OF AMERICA, 1800-E Alcoa Building, Pittsburgh 19, Pa.

ALCOA ON TV brings the world to your armchair with "SEE IT NOW" featuring Edward R. Murrow, Tuesday evenings on most CBS-TV stations.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

LETTERS

B-36 Controversy

In your Strictly Personal column Jan. 11 (p. 96) you charge there were various and sundry inaccuracies in our stories about the investigation of the crash of a B-36 here.

Suppose we review your charges sentence by sentence:

You say: "Stories distributed to Scripps-Howard papers gave GCA a cruel, unfair black eye."

In the first place the Scripps-Howard Newspapers had nothing to do with the story. It was not distributed to them alone, as you infer. It was distributed to hundreds of newspapers by United Press and Associated Press. . . .

The El Paso Herald-Post, which is proud to be just one of the 19 Scripps-Howard Newspapers, is alone responsible for the stories that told the world nine men were killed due to an Air Force foulup.

GCA was not given a black eye, as you say, but the operators on duty at Biggs Base at the time of the crash were. Would you call directing a pilot to make a 370 deg. turn efficient operation? That is admitted by the Air Force.

You say the B-36 "hit a hill" near El Paso! For your information, that "hill" is a granite and limestone mountain 7,200 ft. high, now marred by a large black area where the ship hit and nine men died.

The report of the USAF investigators as relayed to us by Air Force officers here and by Maj. Rollin Bynum, an information officer in Washington, said nothing about the pilot going downstairs for a look, which you allege. Did you know the ship crashed during a snowstorm? If the pilot got a confusing direction from GCA in a snowstorm, wasn't that enough to confuse him and cause him to try to land visually, rather than trust a ground crew that didn't seem to know there were only 360 deg. in a circle?

You say: "There was one operator, not several, and he was experienced—not a teenager."

The Air Force doesn't agree with you, except for your statement that he was not a teenager. The Air Force says there were three operators—a superintendent of crew, age 25, with experience since September 1952; a traffic director, age 21, with experience since May 1952; and a final controller, age 25, with experience since September 1949.

Then you end by saying: "Most other 'facts' in the stories were incorrect."

I read again your seven lines and I find you have just one 'fact' correct. On all others you are incorrect.

It seems to me that when an editor of a publication accuses another publication of inaccuracies, he should be certain that he himself is not inaccurate. In this case, you not only accused the wrong party of inaccuracy, but your accusations were inaccurate.

Here are facts beyond dispute: A B-36 was coming in for a landing at Biggs Field. From the GCA crew it got an order to make a 370 deg. arc; the pilot protested; he got other orders; he smashed into the mountain; nine men were killed; the mountain is a mile west of the base, but the country for 20 miles to the east is flat, open desert.

The Air Force blamed the pilot. He couldn't talk back.

As a passenger in Air Force ships, I have watched pilots make GCA landings when ceilings were as low as 200 ft.

There was no excuse for the Biggs tragedy.

I hope you will see fit to withdraw your incorrect charge against the Scripps-Howard papers and set the record straight.

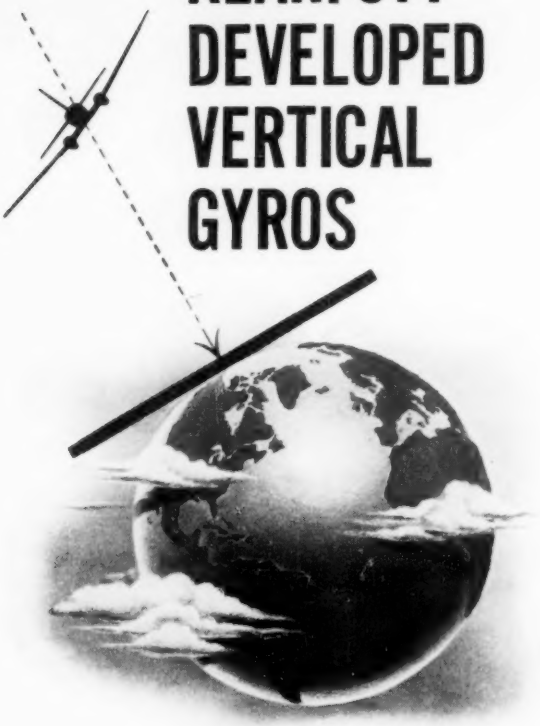
E. M. Pooley, Editor
El Paso Herald-Post
El Paso, Tex.

(The U. S. Air Force has given Aviation Week *the following official information in connection with the B-36 accident:*

Official conclusions of special accident investigating board of Flight Safety Directorate, USAF, say primary cause of crash was an incorrect approach procedure executed by the pilot and poor judgment of the pilot in attempting a visual approach. The B-36 was cleared from Ft. Worth to El Paso on an instrument flight plan. GCA gave correct instructions to pilot to align him with N-S runway. Pilot elected to ignore GCA and attempt a visual approach. He made this clear to GCA operators o radio. GCA continued to monitor the B-36 through two missed visual approaches. On the third attempt at visual approach GCA gave pilot emergency instructions to avoid mountains which pilot acknowledged in time to have

AVIATION FABRICS
to Specification
"FROG" BRAND
by Sawyer
COATED FABRICS
For . . . the fabrication of canopy covers
. . . interior trim
. . . insulation
Vinyl-coated Cottons—Nylons—Fiberglas—and other Synthetics
Made to your specifications. Manufactured in all types, colors, weights and widths to government and AAF specifications. Contact your nearest representative or write us for samples.
NEW YORK: Walter I. Schutt, 18 East 41st St., MUrray Hill 5-3611
William E. Mitchell, 15 West 26th St., MUrray Hill 6-8750
ATLANTA: Maurice E. Woods Co., 83 Cain St., N. E., CYpress 4218
CHICAGO: D. Russell & Co., 331 South Peoria St., RAndolph 8479
DALLAS: W. L. Mellor Co., 1507 Dragon St., Dearborn, LOgan 1-2484
DETROIT: J. L. Gibson, 1116 Beechmont Dr., GRand 6850
KANSAS CITY: W. L. Mellor Co., 2603 Warwick, Andrews Pl., DUnkirk 4-2587
LOS ANGELES: John Sweeten, 516 South St., Seneca 1740
SEATTLE: R. C. King, Inc., 117 Madison St.,
THE H. M. SAWYER & SON CO. Established 1840
Coated Fabrics Division
Watertown 72, Mass.
WAtertown 4-0520

KEARFOTT DEVELOPED VERTICAL GYROS



...in production

KEARFOTT vertical gyros providing continuous vertical reference within two minutes of arc under bench conditions typify the engineering knowhow and production skills available to you in the field of precision gyros for airborne control applications.

Designed for particular applications with stringent performance requirements, a wide variety of vertical gyros now in production are being used extensively in aircraft and missile control systems demanding the most precise gyro reference obtainable.

Kearfott gyros incorporate many unique features permitting operation under extreme operational or environmental conditions. A true hermetic seal in dry inert gas provides positive environmental protection. Synchro pick-offs and rigid structural elements assure performance during adverse conditions of vibration or shock.

TECHNICAL DATA SHEETS

Complete technical data in tabular form on Kearfott Precision Vertical Gyros are available on request. Send for copies for your files. Write today.

KEARFOTT COMPONENTS INCLUDE:

Gyros, Servo Motors, Synchros, Servo and Magnetic Amplifiers, Tachometer Generators, Hermetic Rotary Seals, Aircraft Navigational Systems, and other high accuracy mechanical, electrical and electronic components.

Technical Data on these and other components is available on request.

Kearfott SINCE 1917

KEARFOTT COMPANY, INC., LITTLE FALLS, N. J.

Sales and Engineering Offices: 1378 Main Avenue, Clifton, N. J.
Midwest Office: 188 W. Randolph Street, Chicago, Ill. South Central Office: 6115 Denton Drive, Dallas, Texas
West Coast Office: 253 N. Vinedo Avenue, Pasadena, Calif.

A GENERAL PRECISION EQUIPMENT CORPORATION SUBSIDIARY

avoided a collision with any known obstruction in the area.

There were no teenagers in the GCA shack. All GCA men in the shack were graduates of GCA school and had been logging from 20 to 50 GCA approaches per month for the preceding three months at Biggs AFB, El Paso. Pilot was not on GCA at any time during his approach attempts and so stated over the radio. B-36 crashed into Franklin Mountains Dec. 11, 1953.

That is the Air Force's statement to AVIATION WEEK.

The stories we saw in the New York World-Telegram were labeled as special dispatches to Scripps-Howard papers. We had no idea who else received them and did not say who else did. The fact that the stories went to "hundreds" of newspapers doesn't make them any more accurate. GCA was definitely given a black eye in the opinion of aviation people. The 370-deg. direction was caught and corrected and the pilot acknowledged receipt of correction, we are informed. Whether it was a hill or mountain, the crew should have had charts aboard and were warned.

Information Mr. Pooley cites does not jibe with Pentagon information we were given above. Based on information from other sources it appears that the El Paso paper used reports from disgruntled and not entirely disinterested parties—a CAA employe or employes. There has been strong rivalry between USAF and CAA in the El Paso area on air traffic control matters. In any event, the newspaper stories charged that teen-agers with six-weeks training had caused the loss of nine lives and a $3.5-million aircraft, and this charge has been denied by official Air Force sources.—ED.

Insurance Machines

John R. Chewning, whose letter appeared in AVIATION WEEK Apr. 12 ("Insurance & Nonskeds," p. 94), is misinformed as to the use and function of the insurance vending machines located on airports throughout the United States. I am writing for his information and also for any others interested in this matter.

There are two separate and distinct policies written and sold via vending machines. They are (1) for scheduled airline rides only and, (2) for the irregular air carrier, air taxi operator, charter, MATS and other types of commercial flying.

As for the cost of the policies, the irregular style of policy costs five times as much for a like amount of insurance coverage as the scheduled style. Also for Mr. Chewning's information, there is no *small* print anywhere in the policies and all exclusions of the policies are printed in large print. Here at our municipal airport, we have two separate machines for the sale of insurance policies. The customer pays his money and buys the insurance of his choice.

We believe that these machines, when added to the operation of a fixed-base operator, can be a very lucrative source of revenue.

J. MAX FREEMAN, JR., Asst. Mgr.
Cannon Aviation Co., Inc.
Hickory Municipal Airport
Hickory, N. C.

R C A T's

Radio Controlled Aerial Targets—called R-CATS—are now the standard targets used in gunnery training of fighter pilots and anti-aircraft and airborne gunnery crews of the Armed Forces. These drones are maneuvered from the ground to simulate the attacks of an enemy; aloft they are an inexpensive substitute for "the real thing". Precision-built R-CATS are supplied in quantity to the U. S. Army, Navy, Air Force, and National Guard by RADIOPLANE COMPANY. They are one more product of the versatile Northrop team which has built the famous long-range Scorpion F-89 interceptors, Snark XB-62 pilotless bombers, range finders for Army tanks, and other materiel constructed to rigid specifications of the U. S. Department of Defense.

Radioplane Co.

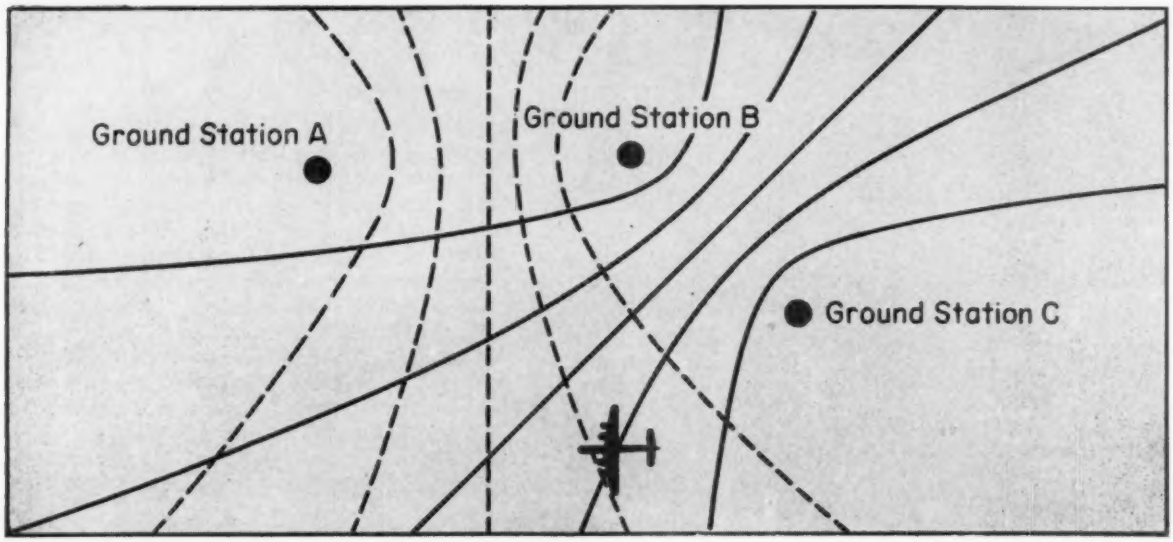
a wholly-owned subsidiary of Northrop Aircraft, Inc.

NORTHROP

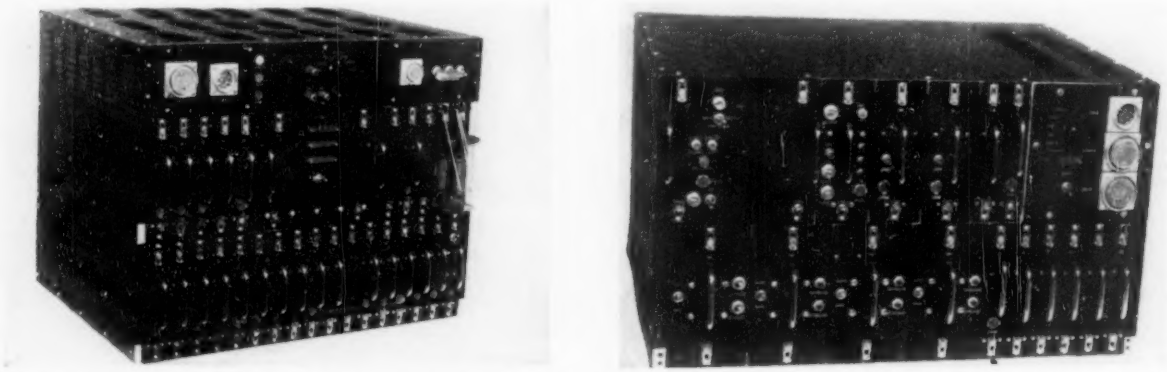
NORTHROP AIRCRAFT, INC. • HAWTHORNE, CALIFORNIA

Pioneer Builders of Night and All Weather Interceptors

5-A-19



HUGHES AIRCRAFT'S DIGITAC, first digital computer designed for airborne use, automatically computes bomber flight path to target and bomb-release point using hyperbolic radio nav system (similar to Loran) and built-in dead-reckoning computer.



DIGITAC consists of computer (left) and input-output equipment, including autopilot coupler (right), which enables Digitac to fly the airplane to its target and to release its bomb load at the required instant.

Hughes Reveals Digitac Details as . . .

Digital Computers Take to the Air

By Philip Klass

Security wraps have been removed from the Hughes Aircraft Co.-developed Digitac, the first digital computer designed for airborne use and the forerunner of what has become a significant trend in airborne computer development (AVIATION WEEK Dec. 29, 1952, p. 27).

Digitac is the principal element in a tactical navigation and bombing system which is fully automatic, even to the point of controlling the plane's flight path and presumably releasing bombs at the required instant.

Developed under the sponsorship of the Wright Air Development Center's Armament Lab, operational details of the new computer were revealed in three papers presented during the recent national convention of the Institute of Radio Engineers. One of the papers, describing the problems of coupling a digital computer to an autopilot, called the HAC program "the first successful use of an airborne digital computer to control an aircraft."

▶ **Pioneering Effort**—When the Digitac development was started in October 1948, the state of the art was such that existing digital computers filled a large-size room and their weight was measured in tons. It is doubtful if any plane smaller than a B-36 could have gotten a 1948-vintage digital computer into the air.

Even the application of digital computers to analog-computer type bombing and navigation problems involving "real-time" computation was relatively new.

The HAC-WADC development was clearly a pioneering effort.

▶ **Advantages**—Here are some of the advantages of digital computation which prompted the effort:

• **Versatility.** A single digital computer

THERE GOES THAT PASSENGER . . .

Since he came back from Europe he's been a man to watch. Over there leading airlines are operating the Viscount and setting up new records for passenger preference—and profits! That passenger found flying by Viscount was something really new! *Certainly* it was the most comfortable flight he had ever made. *Certainly* it was the quietest. *Certainly* one noticed hardly any vibration—and those four turboprop engines inspired a feeling of real confidence.

Watch that Passenger . . . Back in the United States he still flies—and talks—and wonders when he will fly by Viscount again. Perhaps sooner than he thinks. For among the nine airlines that have ordered Viscounts are two that operate into the United States—Trans-Canada Air Lines and British West Indian Airways.

FORECAST INTO FACT

Its designers predicted great things for the turbo-prop Viscount. Here is what it has achieved—so far:

- ***Earned more than $1,000,000 profit for British European Airways in six months.***
- ***Doubled BEA's share of traffic on important routes.***
- ***Cut inter-city flight schedules.***
- ***Won firm orders from ten airlines in both hemispheres—including TCA and B.W.I.A.***

VICKERS VISCOUNT

FOUR ROLLS-ROYCE PROPELLER-TURBINE ENGINES

VICKERS-ARMSTRONGS LIMITED · AIRCRAFT DIVISION · WEYBRIDGE · ENGLAND

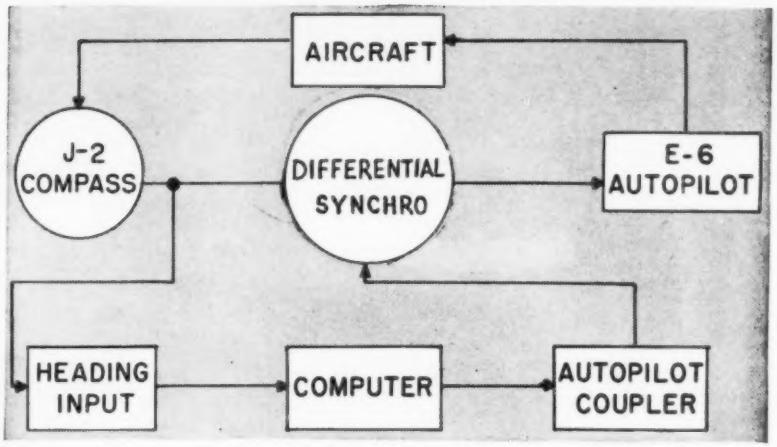
REPRESENTED IN THE UNITED STATES BY CHRISTOPHER CLARKSON, 342 MADISON AVENUE, NEW YORK 17, U.S.A.

can work at a variety of problems, including navigation, bombing, cruise control, predicted time of arrival, and others. The older type of analog computer must be tailored to one single, specific task. For similar reasons, a digital computer can quickly and easily be changed to handle new problem-parameters (such as new bomb ballistics) which might require very extensive modification in an analog computer.

• **High accuracy.** Extremely high-order accuracy can be obtained in digital computation with little increase in cost or complexity. Comparable accuracy may be impossible with analog computers, or else involve extremely precise and costly component parts. At each stage in analog computation, there is some loss of accuracy. In digital computation, there is no degradation of accuracy regardless of the number of operations.

• **Easy to produce, maintain.** Digital computer construction uses many identical electronic circuits, such as flip-flops, which can be mass-produced by relatively unskilled labor, or by automation techniques. Many analog computer parts must be made with extremely precise machine tools, then painstakingly inspected for accuracy and conformance.

Test and inspection of digital computer circuits can be performed quickly and automatically. Lack of complex mechanical assemblies in digital computers permits wide use of quickly replaced plug-in assembly construction.



BLOCK DIAGRAM shows how Digitac introduces computed heading changes into E-6 autopilot by differential synchro between gyro-compass and autopilot.

Probably the most serious shortcoming of digital computers is their widespread use of electron tubes, which raises problems of reliability. Analog computers use fewer tubes, mostly for servo amplifiers.

However, more reliable premium-type tubes, and eventually transistors, should ease this problem. Because most digital computer tubes are used as on-off switches, marginal checking procedures can be used to detect incipient failures due to tube deterioration.

► **Tactical Bombing Problem**—Digitac is designed to work with a ground-based hyperbolic radio navigation system, resembling Loran. Pulses of RF energy are transmitted at known intervals from three ground stations, A, B, and C. The difference in arrival times (at the aircraft) of pulses from Stations A and B, and the time difference between B and C, can be used to calculate the airplane's position relative to the stations.

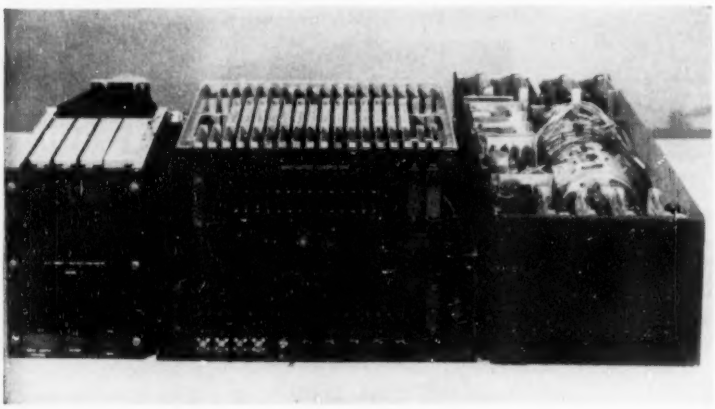
Digitac's task is to determine bomber position, calculate where it must release bombs (based on plane's speed, altitude, etc.) to hit a target of known position, determine what heading the bomber must fly to reach the bomb-release point, control the plane through its autopilot to bring it to the point of bomb release and, finally, trigger the bomb release.

Digitac can be programmed to guide the plane to a series of targets and bomb release points, possibly as many as 20 or 30.

► **Establishing Aircraft Position**—Digitac determines bomber position in space from a combination of radio navigation and dead reckoning, or solely from dead reckoning when the radio signals are not usable. The combination is used to smooth out minor variations or noise in the radio signals.

The dead reckoning computation is made from continuous and automatic inputs of airplane heading, airspeed, previously computed airplane position, and wind velocity and direction (previously calculated from radio navigation information).

Interesting feature, arising from a digital computer's ability to "make decisions," is that Digitac automatically determines when radio signals have become unusable and then switches over exclusively to dead reckoning. When radio signals improve sufficiently, Digitac automatically reverts back to the combination mode of determining



Advanced Airborne Computer

First photo of new advanced airborne digital computer, developed by Hughes Aircraft for use with a new interceptor fire control system, shows more compact construction than earlier Digitac. Information released on the new computer includes:

- **Clock pulse rate: 160 kc.**
- **Volume: 4.5 cu. ft.**
- **Accuracy: 1 part in 65,000.**
- **Magnetic drum storage: 2,500 19-digit words.**
- **Fast access storage: eight words in circulating register.**
- **Address system: modified two-address, floating reference.**
- **Operations: 64, including addition, subtraction, multiplication, division, square root, check sign, logical choice, logical multiplication, shifting, transfer.**
- **Inputs: 64 analog inputs.**

what is the position of the bomber.

▶**More Decisions**—Digitac recomputes its answers every half second. During this time it makes more than 50 "decisions," E. E. Bolles told the IRE. Bolles was formerly with Hughes, is now with Ramo-Wooldridge.

"Each input, such as altitude, is first checked to determine if it is within a maximum and minimum bound and then is checked by comparison with the past value. If the quantity either exceeds the bounds or the change from the past value is too great, then this quantity is discarded and the previous value is used," Bolles said. This technique greatly reduces the effects of any "noise" present in the input data, Bolles added.

The computation cycle for the dead reckoning portion of Digitac requires only 0.3 second, 0.2 second less than the cycle needed to fix position by radio signals. In its "spare time," the dead reckoning section can be used to perform bomb trajectory and release-point computations, without requiring additional machine capacity for this specific task.

▶**Digitac Flight Tests**—Nearly 60 flight tests were made on Digitac over a 14-month period starting in June, 1952, Dr. E. M. Grabbe told the IRE. The test plane was a C-47 equipped with a Minneapolis-Honeywell E-6 autopilot.

D. W. Burbeck and S. B. Neister of WADC were co-authors of the paper. Interesting sidelight is that Grabbe, Burbeck, as well as Bolles, have recently left Hughes to join the Ramo-Wooldridge Corp., newly formed company headed by two former HAC vice presidents.

Flying over well-defined areas in metropolitan Los Angeles, a vertically stabilized camera was used to check the accuracy of the basic radio navigation system, Dr. Grabbe said. The latter was then used to check the accuracy of Digitac's performance, including its dead reckoning computations. Many of the design changes which were tried during the Digitac flight tests to improve system operation could be made quickly without holding up tests, Dr. Grabbe said, pointing up another advantage of the inherent versatility of digital computers.

Details on Digitac's accuracy are still classified. However, Bolles told the IRE that the novel digital counting technique which Digitac uses to measure automatically the time differences between pairs of radio pulses provides an accuracy of 0.02 microseconds or about one part in 30,000.

▶**Digitac Details**—The complete Digitac system, including digital computer, receiving and time-measuring circuits, power supply and autopilot coupler, occupies a volume of 12 cu. ft., weighs around 250 lb. The digital computer

(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

The big yellow sheets of ruled paper looked formidable with their hundreds of neatly written figures, but they told a straight story — the story of Whittaker business during 1953.

They had to be deciphered for me at first, of course, but once I learned the key I could read the story myself.

And the climax interested me most.

I found final action was taken on 372 basic valve proposals made by Whittaker last year and of these, 36 percent were sold, 53 percent cancelled and but 11 percent lost to competition.

I would say that was an excellent record for a year's business.

But the Whittaker experts shook their heads:

"Good—yes. But not good enough. We can do better."

They explained to me that this extraordinarily detailed analysis is made each year — a complete breakdown of business according to customers, aircraft, valve types and the dollar volume for each — primarily to show up weaknesses as against strength. In other words, to pinpoint by cold figures the lines in which the company must improve to stay in front.

Nothing is left out. It's all there on the record and each category is summed up in two sets of figures, "proposals" vs. "sales."

"Why," I asked, "the high percentage of cancellations?"

"It's just the nature of the business," the experts told me. "We often wonder if the primes know how much work we equipment manufacturers lose, how much time and money is spent in providing an end result in the exact valves that are required.

"You see," they went on, "this isn't like, say, the auto industry where you can plan with reasonable assurance what you'll be doing next year. We have to meet new demands as they come.

"We'll be asked to bid on a valve. We'll look into the possibilities, work out some designs. Sometimes we go no farther, for you might call Whittaker conservative. We won't bid on something we can't handle. We don't go in for blind proposals just as we don't advertise units that are theory rather than fact.

"On the other hand, a project may look good and we put in a great deal of effort, only to have the prime cancel out because of unforeseen changes. Or because the military has turned down a proposed system.

"It's no one's fault! It's just one of the factors you have to contend with in this fast-moving business . . ."

"How about this business lost to competition?" I asked.

"That's a challenge," they replied. "Our analysis is designed to show us just where we are weak. Then we work to change and perfect our operation. No use sticking our head in the sand.

"Any business can always be better. Unless we admit weak points — and dig 'em out — we're not likely to stay at the head of the parade, or even keep up with it!

"Several years ago we found our hydraulic business down. The analysis figures rang the alarm and we started a small upheaval. The result: a 'new look' in hydraulic valves, outstanding designs, reduced weights, better performance — and climbing sales."

The experts explained to me, too, that the analysis indirectly helps the field engineers improve Whittaker service and here they pointed out Whittaker's batting average:

Prototypes within 30 to 60 days after initial order, first production shipment within 90 to 120 days.

As I scanned a figure-covered page I asked another question:

"There were 372 basic valve proposals listed as 'acted upon,' yet this page shows a total of 479 projects last year. What of the others that make up the difference?"

"Fifteen are still in engineering," I was told, "and 92 are still out, with no decision as yet."

"Then," I said, after a little mental calculation, "you actually sent out 464 formal valve proposals during the year?"

"Right."

"And that means that Whittaker turned out an average of better than 38 new designs each month?"

"Correct."

"How can you top that?"

"We will."

I'll bet they do, too!

itself occupies 5½ cu. ft., weighs 130 lb.

Bolles and others freely admit that Digitac is made obsolete by more recent digital computer developments at Hughes and elsewhere. Pointing out that no attempt was made to achieve optimum miniaturization in Digitac because of its experimental nature, Bolles estimates that the computer volume could be reduced to 1½-2 cu. ft. by using transistors in place of tubes.

The complete system uses 434 tubes; the computer portion uses 260 tubes and 1,300 diodes. Total power consumption is 1,300 watts, including power for the required cooling system.

▶ **What Makes Digitac Tick**—In digital computer language, Digitac is a dual-address, binary-coded machine operating in serial manner.

A serial-type machine sacrifices speed to reduce complexity. However, Digitac speeds solution time by using a dual-address instead of a single-address type of operating instruction.

Other basic characteristics of the computer include:

- **Solution (iteration) time:** 0.5 second for navigation and bombing problems.
- **Clock pulse rate:** 100 kc.
- **Word length:** 17 bits, including sign.
- **Memory-storage:** Rotating (7,000 rpm.) magnetic drum, with storage capacity for 1,056 words (two-address commands, problem constants, computation results) plus a six-word fast-access circulating register for intermediate results.
- **Address system:** Floating reference (instruction for finding next operating command on the magnetic drum is referenced to the position where the previous operation was recorded).
- **Number of possible operations:** 37, including 24 which cause computer to sample individual input signals or which order output of computer signals for navigation and bombing control. Remaining 13 operations are normal arithmetic operations of addition, subtraction, multiplication, division, and associated transfer operations. One decision-type operation is provided to select one of two alternate successive orders, such as alternate operating modes or to check the quality of input signals, as earlier described.

▶ **Autopilot Coupler**—When a digital computer is used to control an airplane's flight path via its autopilot, problems arise because of the inherent computation-cycle delay (0.5 sec.).

Whereas an analog computer with continuously varying inputs produces a continuously varying output signal, Digitac produces a new output signal only once every half second.

Another problem arises because a digital computer may malfunction in a single computation cycle and come up with a radically wrong control signal. If fed directly to the autopilot, it could start a dangerous maneuver.

▶ **Introducing Digitac Signals**—The Hughes autopilot coupler introduces Digitac output (steering command) signals into the basic autopilot loop by means of a differential synchro between the J-2 gyro-compass and the E-6 autopilot, which modifies the gyro-compass heading signal received by the autopilot.

Hughes selected this approach, W. L. Exner told the IRE, in preference to feeding autopilot signals into Digitac because of aircraft stability considerations. (A. D. Scarbrough co-authored the paper.)

If the high-frequency transient signals developed in an autopilot were fed through Digitac, spurious transients generated within the digital computer would also pass through into the autopilot-airplane control system, Exner pointed out.

It is preferable to filter out these computer-generated transients and use smoothing techniques which are only possible if the digital computer itself remains outside the basic airplane-autopilot loop.

▶ **Digital to Analog Conversion**—The digital output of Digitac is converted to analog rotation of the differential synchro by means of a shifting-counting type electronic register which operates a notching motor that drives the synchro. After each computation cycle, Digitac deposits its output (steering signal) in the register which is then "counted down" toward zero by a pulse generator.

Each pulse applied to the register during count-down causes the notching motor to rotate the differential synchro an amount corresponding to a heading change of ¼ degree, in a direction determined by the "sign" of the signal in the register. When the register has been counted down to zero, the differential synchro has introduced a course change into the autopilot corresponding to the Digitac steering signal.

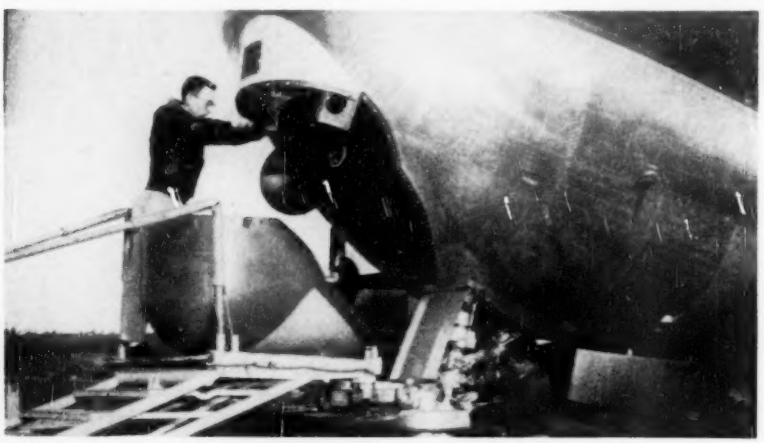
When large steering signals accumulate in the counting register for more than brief intervals, the count-down rate is increased automatically, by a factor of up to 4:1. This technique "has been demonstrated to be highly satisfactory for controlling the aircraft when the required heading changes are within the ±12.6 deg. capacity of the shifting-counting register," according to Exner and Scarbrough.

For extremely large heading-change signals, up to 180 deg., the register causes the differential synchro to rotate at a still faster rate, putting the plane into a steep banking turn whose angle is limited only by autopilot-airplane limitations.

▶ **Bright Future**—Messrs. Grabbe, Burbeck and Neister sum up the future of airborne digital computers this way:

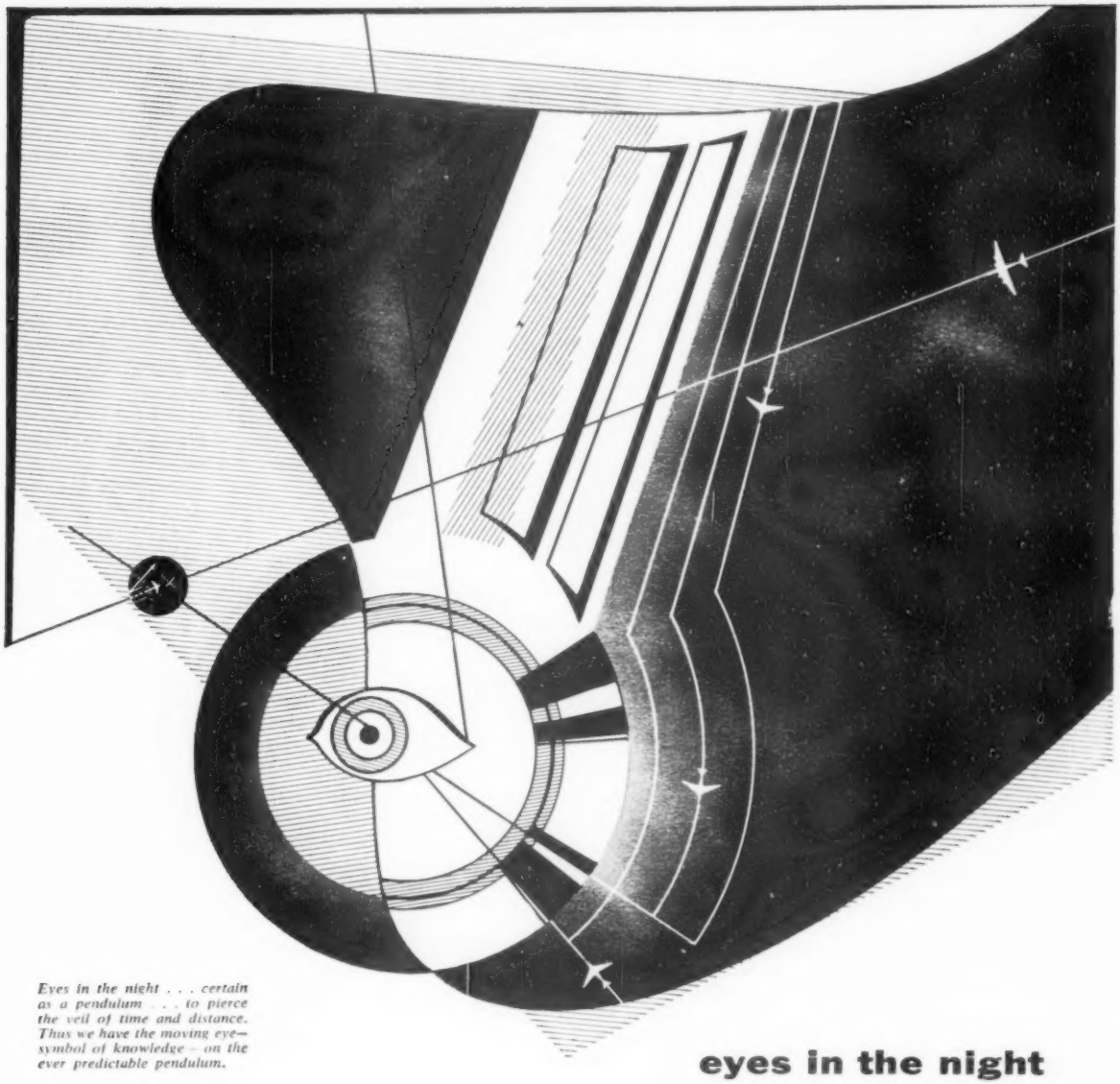
"The day is not too far off when one standard airborne digital computer will be used in a variety of different military and commercial (aircraft) systems for automatic navigation and control . . . (and) may also act as a central computing point for a variety of auxiliary computations."

Hughes Aircraft is continuing work in this field. Its new advanced general-purpose airborne digital computer, probably slated for use in an advanced interceptor fire control system, was displayed for the first time at the Hughes booth during the recent IRE convention. First public discussion of a new tran-



Radar for Refueler

Airborne AN/APS-42A radar, shown being installed in chin of Boeing KC-97G Stratofreighter, operates with other avionic gear to help huge tanker rendezvous with other aircraft during aerial refueling operations. The radar is also used for storm avoidance, navigation and terrain clearance. RCA and Bendix-Pacific are making the C-97 units.



Eyes in the night . . . certain as a pendulum . . . to pierce the veil of time and distance. Thus we have the moving eye—symbol of knowledge — on the ever predictable pendulum.

eyes in the night

The victory over time and darkness is certain with Kollsman instruments. Certain because of our quarter century dedication to accuracy in controls and instrumentation.

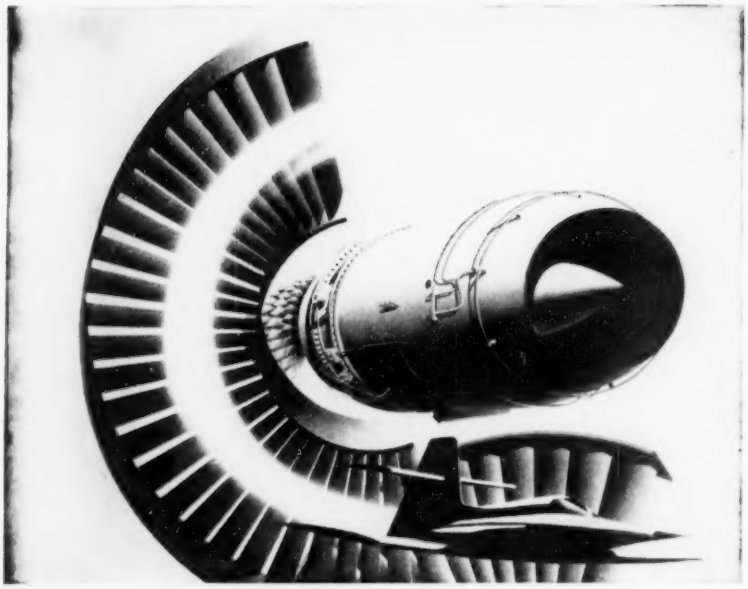
Today our activities encompass four fields:

AIRCRAFT INSTRUMENTS AND CONTROLS
OPTICAL PARTS AND DEVICES
MINIATURE AC MOTORS
RADIO COMMUNICATIONS AND NAVIGATION EQUIPMENT

Our manufacturing and research facilities . . . our skills and talents, are available to those seeking solutions to instrumentation and control problems.

kollsman INSTRUMENT CORP.

ELMHURST, NEW YORK • GLENDALE, CALIFORNIA • SUBSIDIARY OF *Standard* COIL PRODUCTS CO. INC.



At the Westinghouse Jet Plant in KANSAS CITY . . .

The challenge you've been waiting for

Unlimited Opportunities in

RESEARCH • DEVELOPMENT • MANUFACTURING

on the latest types of gas turbine engines and further improvement of our engines flying in America's foremost planes

Unlimited because you can give full play to your ability in . . .

FLUID DYNAMICS	GEARING AND LUBRICATION
MECHANICAL DESIGN	ENGINE CONTROLS
INSTRUMENTATION	ENGINE AND FLIGHT TEST
FUEL AND IGNITION SYSTEMS	METALLURGY
PERFORMANCE ANALYSIS	TECHNICAL WRITING

Equally attractive openings for Layout Draftsmen, Computer Programmers, Mathematicians and Technical Assistants.

Opportunity for advancement and security, too . . .

Incentive Awards are given for inventions and ideas. We pay tuition for any graduate study you do under our program.

"Extras" include modern pension plan, low-cost life, sickness and accident insurance, plus company stock purchase plan.

Security we consider important. Promotion is from within. Our men average over ten years' service.

Living Conditions are pleasant in Kansas City; and we help you find housing.

J-54035

SEND RÉSUMÉ TO: G. R. Northrup, Aviation Gas Turbine Division
Westinghouse Electric Corporation
Lester P. O., Philadelphia 13, Pennsylvania

YOU CAN BE SURE...IF IT'S
Westinghouse

sistorized airborne digital computer, the Tradic, developed by Bell Telephone Labs, is scheduled for the National Conference on Airborne Electronics in Dayton, this week.

Only their most enthusiastic proponents would suggest that digital computers will ever replace analog computers in all airborne applications. However, the fact that more than a dozen companies are now developing airborne digital computers is testimony of their potentialities.

FILTER CENTER

► **Neat Trick**—Wilcox Electric recently set up its new packaged low-power omnirange station at Dorval Airport, Montreal, and put it into operation within five days after the equipment arrived on the site, despite an intervening blizzard. Object was to demonstrate the new VOR to members of the Fifth Communications Session of the International Civil Aviation Organization meeting in Montreal.

► **UAL Radar Report Issued**—United Air Lines has issued a 108-page report on the results of last summer's flight tests on an experimental C-band (5.5 cm.) airborne radar. Report's conclusions, highlighted earlier in AVIATION WEEK (Sept. 28, 1953, p. 84; Dec. 28, 1953, p. 7) strongly favor C-band over X-band (3.2 cm.) for airline use.

► **Nip and Tuck**—New Sperry and General Electric computing gunsights (for fighters) are battling for USAF favor at evaluation tests now underway at Air Force Armament Center, Eglin AFB. At the moment, observers report it is a toss-up as to which will get the production nod. —PK

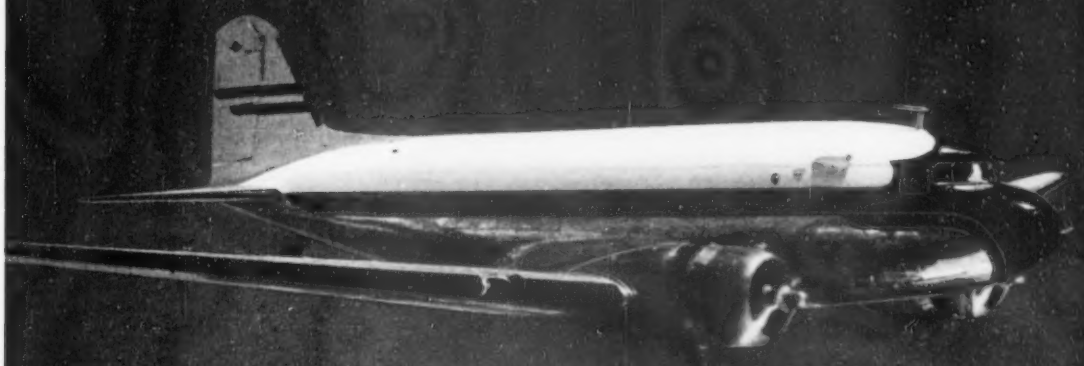
New Avionic Bulletins

Recently announced technical bulletins and catalogs of interest to designers of avionic devices and equipment include:

- **Microwave communications** and multiplex equipment (12 pp.). Collin Radio Co., Cedar Rapids, Iowa.
- **Precision wire-wound resistors**, MIL-types, Bulletin D-1, (4 pp.). International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.
- **Wide-band oscilloscope**, Type 323, offering precision measurement of both time and amplitude (12 pp.). Allen B. DuMont Labs, Inc., Technical Sales Dept., 760 Bloomfield Ave., Clifton, N. J.
- **Selenium rectifiers**, hermetically sealed cartridge type, Data Bulletin No. 178 (6 pp.). Radio Receptor Co., Inc., 251 W. 19th St., New York 11, N. Y.
- **Mercury batteries**, miniature, constant-potential cells for use in transistor circuits (6 pp.). P. R. Mallory & Co., Inc., Battery Div., North Tarryton, N. Y.
- **Thermistors**, what they can do and how they can be applied. Ask for publication TH-13 (52 pp.). Carboloy Dept., General Electric Co., Detroit, Mich.

Collins flies with

THE LOCAL-SERVICE AIRLINES



NORTH CENTRAL · MOHAWK · OZARK Air Lines · CENTRAL AIRLINES Inc.

As vital as any cog in the great commercial aviation chain, local service airlines must maintain on-time arrivals to connect with the coast to coast airlines. Collins Communication-Navigation equipment helps them do the job by providing dependable VHF communications in all weather, reliable omni, accurate ILS performance under all operating conditions. This is Collins contribution to Local Service Airline operations.

COLLINS

COLLINS RADIO COMPANY
Cedar Rapids, Iowa

11 W. 42nd Street	NEW YORK 36
1930 Hi-Line Drive	DALLAS 2
2700 W. Olive Avenue	BURBANK

17M-1 VHF TRANSMITTER — 350 remotely controlled channels. Minimum of 40 watt signal on any VHF channel — excellent stability. Special attention given to elimination of spurious emissions. The 17M-1 is the only transmitter of its type that complies with ARINC 520 specifications.

51X AIRBORNE VHF RECEIVER — Companion to the 17M-1 transmitter. 360 channels. Provides complete VHF coverage. Designed especially to meet ARINC 520-A requirement. Special attention has been given in engineering and manufacturing to the elimination of spurious responses.

51R-3 NAVIGATION RECEIVER — Fulfills navigation and communication receiving requirements of all types of commercial aircraft using the 108 to 136 mc band. Provides for omni, VHF communications and ILS. The Collins 51R-3 is the standard VHF receiver for the aviation industry.

THE **OLIVER** CORPORATION • AVIATION DIVISION

FACILITIES*

FACILITIES THAT COULD BE OF SERVICE TO YOU!

*TOOLING FACILITIES

Pratt and Whitney No. 3 jig borer
Sellers Horizontal Boring Mill
Thompson Surface Grinder—18" x 72"
Milwaukee Horizontal Milling Machine
Milwaukee Vertical Milling Machine
Hydraulic Planer — 144" open side
Complete Tool Grinding Department
Complete Template Department
Template Photographic Department
Radial Drills, Shapers, Grinders

*MANUFACTURING FACILITIES

Farnham Mill
Farnham Roll
Wilson Hydro Press — 100 Tons
Clearing Hydro Press — 7000 tons
Sheet Metal Shrinker
Farquhar Stretch Press — Extrusion
Ekstrom Router
Vertical and Horizontal Mills
Hot Dimpling Machines

*METAL PROCESSING AND LABORATORY FACILITIES

Anodizing — Tank Size 4' x 6' x 30'
Circo Vapor Spray Degreaser
Ajax Electric Salt Furnace — Size 3' x 5' x 16'
Two (2) Despatch Gas Fired Ovens
Sciaky Spot Welder
Gas and Heliarc Aluminum Fusion Welders
Fluorescent Penetrant Inspection — (Zyglo)
Complete Chemical and Metallurgical Laboratory
Complete Functional Test Equipment

OTHER PLANTS: Battle Creek, Michigan; Charles City, Iowa; South Bend, Indiana; Cleveland, Ohio; Be-Ge Mfg. Co., Gilroy, California; A. B. Farquhar Division, York, Pennsylvania; Springfield, Ohio; Shelbyville, Illinois.

*Complete Brochure on Plant Facilities Available Upon Request

THE OLIVER CORPORATION
AVIATION DIVISION
112 SOUTH McCAMLY STREET
BATTLE CREEK, MICHIGAN

PROTECT

METAL with METAL
TUBING SEAL CAP PRODUCTS

The Accepted Standard

NOW DE-GREASED for super-protection! The original Protective Metal Closures by Tubing Seal Cap, Inc. offer assurance of maximum efficiency by coming to you clean, clean, clean: DE-GREASED!

For the protection of Hydraulic Lines, BT Nuts and Hydraulic Components during shipping and storage, Tubing Seal Cap, Inc. products are better because . . .

1. They're Metal! . . . can't chip or be sucked into lines.
2. They're Metal! . . . can be reused many times.
3. They're Metal! . . . can be spun on and off easily by hand.
4. They're Metal! . . . they withstand the hardest knocks and shocks.
5. They're Metal! . . . new long fluted flange for easier use.
6. They're Metal! . . . DE-GREASED, they come to you clean.

For maximum safety use the Accepted Standard! Tubing Seal Cap Protectors! Caps, Plugs, Boss Plugs, Shipper Caps and Plugs.

TUBING SEAL CAP, INC.

808 WEST SANTA ANITA
SAN GABRIEL, CALIFORNIA

SEND TODAY!
for NEW 1954 ILLUSTRATED CATALOGUE and PRICE LIST. (On your firm letterhead, please!

BuAer Tests Silver-Zinc Aircraft Battery

• More capacity at less weight is claimed for new ion-exchange power units that Navy is testing.

By George L. Christian

A new type of storage battery which is several times smaller and lighter than lead-acid batteries of equivalent capacity is being tested for aircraft applications by the Navy's Bureau of Aeronautics. Wright Field will soon start evaluating the unit too.

A major advantage of the unit, called the Yardney Silvercel, is that its high capacity and ability to withstand high discharge rates make it capable of starting jet engines several times before becoming completely discharged.

► **Many Starts**—During a recent test on a Grumman F9F-6, a Yardney Electric Corp. Silvercel battery of the standard AN3150 aircraft size restarted the plane's engine 10 times in a 90-minute period. Test had to be discontinued because the engine's starter got too hot, Yardney says.

The Silvercel was checked and found to have retained half of its original capacity. Yardney officials estimate there was sufficient charge left to have started engine another eight times.

Implication is that jets may no longer be dependent on auxiliary power starting means, flame-out engines can be restarted in flight mechanically rather than by windmilling, and, in case of inflight generator failure, plane's electrical system will remain operative about three times longer than if it were powered by a lead-acid battery, according to Yardney.

The cells have been used in airborne applications for two and a half years, primarily in missiles where their light weight, small size and high capacity are of major importance, Yardney says.

► **Silver, Zinc & Ions**—Two principles on which the Silvercel is based help give the battery the many advantages claimed for it. They are the alternate silver-zinc plate construction and the ion exchange principle.

• **Silver-zinc.** The silver-zinc makeup of the battery's plates results in the small size and light weight of the unit. Also, the relatively low mass of the electrodes makes the battery cells particularly resistant to shock and high G loads. The electrolyte is potassium hydroxide.

• **Ion exchange.** Martin Kagan, Yardney vice president, told AVIATION WEEK that the ion exchange principle, which he said was originated by his company and is fully covered by patents, brings added advantages to the Silvercel. Since only ions, not chemicals, are exchanged between plates, "mossing" of plate materials and resultant possibility of internal shorts are eliminated, prolonging the cell's life to two to three times that of a lead-acid battery.

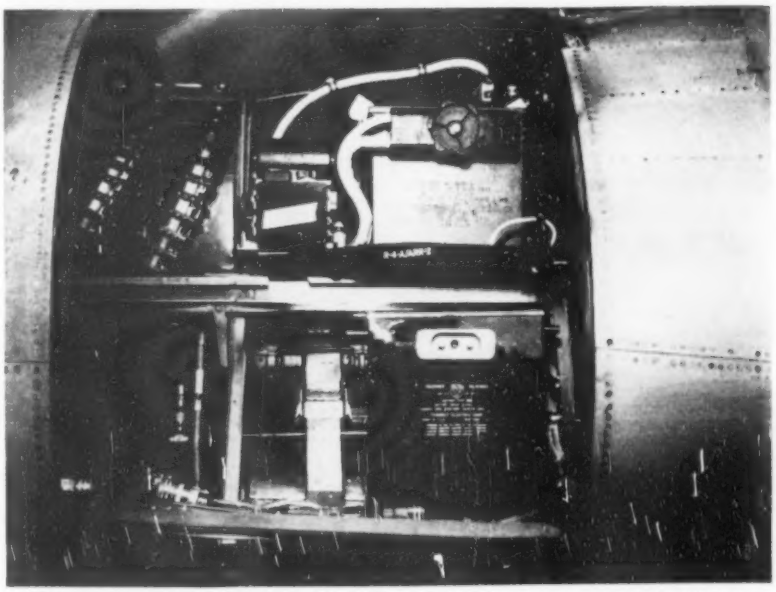
Yardney licked a weakness of the first ion exchange cells—ion exchange separators were not conducive to high rates of discharge. Recently, company technicians developed specially designed plates which have better high-charge and discharge-rate characteristics.

The firm produces two different types of cells. The LR series has long cycle life and average high-discharge rates, while the HR series has a very high discharge rate but a lower cycle life.

Kagan made these cycle life comparisons with a lead-acid battery: LR series Silvercel, 80 complete cycles; HR series Silvercel, 30 cycles; lead-acid battery about 30 cycles.

The new cells with the specifically designed plates are called HRV cells and combine most of the advantages of both

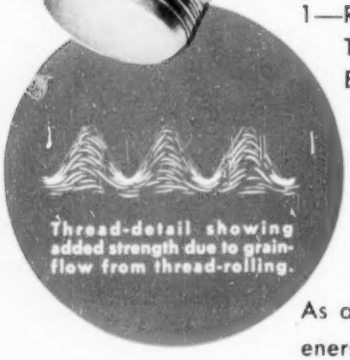
BATTERY under nose of Grumman jet can do job of auxiliary power unit in jeep.



AIRBORNE INSTALLATION shows Yardney Silvercel under standard AN3150 battery in sweptwing Grumman fighter. Silvercel is smaller, has three times the capacity.

THE NEW MS SERIES BY BRILES

Head section showing grain flow. Fillet rolled after heat treat for strength concentration.



Thread-detail showing added strength due to grain-flow from thread-rolling.

MIL-B-7838 SPECIFICATION FEATURES

1—Rolling Fillets and Threads After Heat Treat . . . (Increases Strength Through Elongated Grain Flow)

2—160,000 to 180,000 PSI to Withstand An Average of 65,000 Fatigue Cycles

3—100% Magnetic Inspection

As a pioneer producer of precision fasteners for the Aircraft industry exclusively, Briles specialized experience in cold heading and thread rolling gives the industry fasteners of the highest quality on a production basis.

BRILES MANUFACTURING COMPANY

COLD HEADED RIVETS AND BOLTS
3/32" to 1 1/2" Dia.
EL SEGUNDO, CALIFORNIA

the LR and HR series. The HRV cell is now in production and is going into jet aircraft batteries.

► **High Discharge Rate**—Kagan quoted these comparative high discharge rate figures for standard AN3151 and AN3150 lead-acid aircraft batteries and their Silvercel equivalents.

- AN3151 (Lead-acid) . . about 180 amp.
- JSB3151 (Silvercel equivalent) . . . . . up to 800 amp.
- AN3150 (Lead-acid . . about 500 amp.
- JSB3150 (Silvercel equivalent) . . . . . up to 1,800 amp.

Very low internal resistance permits these high discharge rates. Maximum permissible current draw is limited only by the heat generated within the cell. Yardney adds that the ampere-hour efficiency of the Silvercel is affected very little at high discharge rates.

► **Light & Small**—Weight and size ratio comparisons between the Silvercel and conventional lead-acid batteries show the following (Yardney battery is model HR100, with 100 ampere-hour nominal capacity):

	Silvered	Lead-acid[1]	Ratio
Amp.hr./lb.	37	5	7.4
Watt-hr./lb.	56	10	5.6
Amp-hr./cu. in.	2.25	0.43	5.2
Watt-hr./cu. in.	3.4	1.3	2.6

[1]Approximate

As a result of these comparisons plus those of many other size batteries, Yardney makes the claim that its Silvercel units are roughly six times lighter and five times smaller than equivalent lead-acid batteries.

► **Maintains Charge**—The Silvercel has an unusually long shelf life. In the dry state, the battery is said to have an indefinite shelf life.

A dry battery may be filled, charged, completely discharged and still be good for a year under field conditions. This is called the "ready state." Batteries have lasted two years under laboratory conditions.

A discharged battery in the ready condition may be fully charged in one hour. Yardney cautions that the one-hour charging time is not recommended as a steady diet, but may be done occasionally without damage to the unit. Standard minimum time is two hours.

When a cell in the dry condition is filled, a soak period of two or more days is usually allowed.

► **Flat Voltage Curve**—The Yardney battery has a very flat voltage curve. Kagan points out that the curve remains flat until the battery is almost completely discharged. The curve remains flat regardless of discharge rate, although the level of the curve will vary.

Thus the cells will deliver full voltage until power is almost completely exhausted.

► **Negligible Maintenance**—Big consideration from both the military and com-

mercial point of view is the almost complete lack of maintenance required by the Silvercel battery. Under high-temperature operating conditions, electrolyte is added once or twice a year.

Under two different test conditions, only 4% electrolyte was added to Silvercel batteries after operating under average temperature conditions for nine months.

It was unnecessary to add even this small quantity of electrolyte, Paul Howard, technical director explains, but it was done to measure the amount of electrolyte required to bring the level up to the full mark.

Yardney declares that for most models of Silvercel it should not be necessary to add electrolyte during the entire life span. After being filled initially with potassium hydroxide, further additions need only be distilled water.

Only care required of the battery is to keep it reasonably clean.

▶ **Spillproof**—The Silvercel is spill-proof. Almost all the electrolyte is absorbed by the ion exchange material in the cell's separators. Liquid level is highest in the charged condition and lowest in the discharged condition.

The battery is not necessarily leak-proof, Yardney cautions. Leakage, however, has been occasional and only in missiles at altitudes not reached by other types of aircraft.

The chemical reactions occurring during operation of the battery are entirely reversible. They may be expressed this way:

$$Ag + Zn(OH)_2 \rightleftarrows \underset{\text{discharged}}{AgO} + \underset{\text{charged}}{Zn} + H_2O.$$

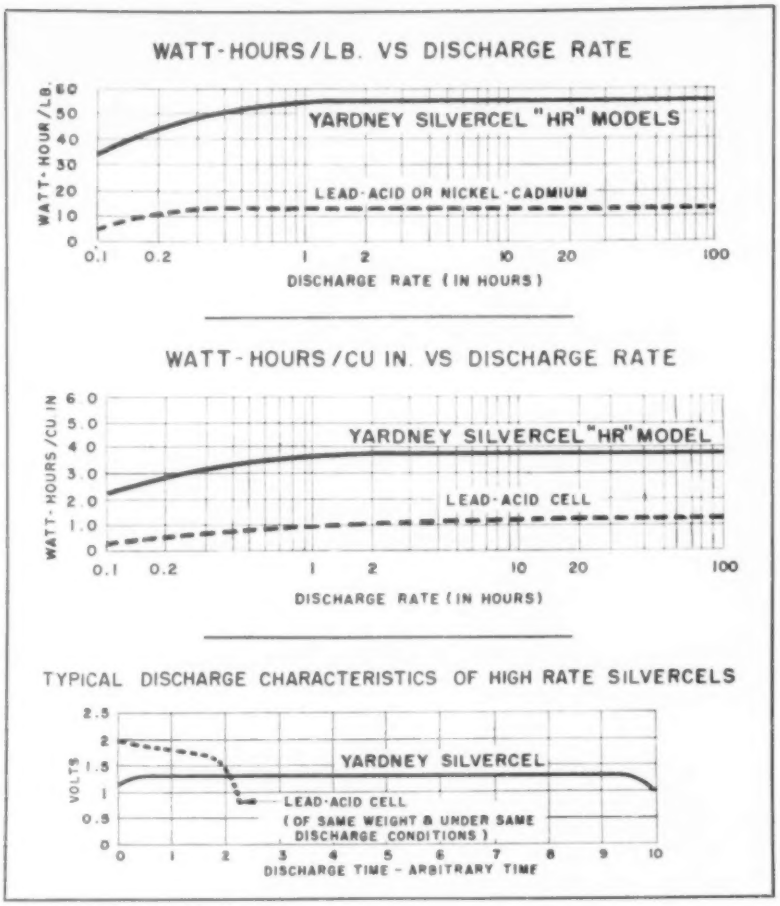
▶ **Mechanically Strong**—Relatively low weight of the materials inside the cell are said to make the unit quite immune to mechanical stresses such as shock, vibration and acceleration. This resistance is aided by the fact that the interior of the cell acts as a solid, compact mass, which, when wetted down, swells, thereby compacting the mass even still further.

In a special case, a Silvercel operated normally under conditions of 1,000G built up in a matter of milliseconds, Kagan reported.

He quoted these results of a specific test, performed by a government agency, on a 1 amp.-hr. Silvercel:

"80G accelerations were run up in a centrifuge, followed by 500G at 5-millisecond shock. Cell was subjected to 2,000-cycle vibration with resonant peak of 100G. Tests were performed in three planes. Performance of the cells was efficient throughout the test."

Other tests cited by Yardney show that during discharge under 10G vibration and 100G shock in various planes, voltage variation was less than ½% with no loss in capacity.



▶ **Altitude & Temperature**—Yardney batteries perform well at extreme altitudes, the company says. With proper packing, they have operated as high as 85 miles.

The cells have good temperature resistance. At the high range, cells can operate satisfactorily at 165F for sustained periods of time. High-temperature limits depend on type of container (currently cases are plastic) and boiling point of the electrolyte.

At the low end of the scale, the electrolyte will freeze between −59F to −73F. The higher the charge, the greater its resistance to cold.

Under severe cold conditions—say −65F—the cells can be warmed up to proper operating temperature in 10-15 min. by shorting out the two poles. This creates internal heat to make the battery operative but in no way injures the unit, Yardney says.

▶ **Aeronautical Applications**—The Silvercel has seen aeronautical service for the past 2½ years. Primary duty has been in missiles. Boeing Airplane Co. alone has taken delivery of over 8,500 units. Yardney says that not one of these units was rejected after Boeing inspection.

Cells are also going into missiles manufactured by Hughes Aircraft, Raytheon and Bell Aircraft. Silvercels are going into a production item made by Airborne Instruments. Solar is using the battery to supply current to the starter of a gas turbine auxiliary power unit. Navy has a helicopter installation of the battery.

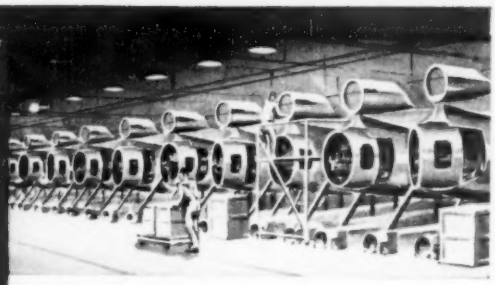
▶ **Military Evaluation**—Yardney officials point out that if the Silvercel becomes standard equipment on jet aircraft, it will mean that designers may return to putting electric starters back into the planes from which they have been removed instead of having to introduce other power sources such as cartridge starting.

They say: Since you must have an electrical system in any plane, why not put it to as many uses as possible instead of having multiple systems on the aircraft.

The batteries not only could restart flame-out engines, but would allow planes which have made emergency landings at small fields not equipped with auxiliary power units, to get started under their own power.

Stretching the availability of electrical power up to three times over that pre-

deadly trigger finger..



. . built by CROSLEY

Concealed in the B-47 bomber is a Crosley-built Fire Control System to put the finger on enemy planes fast. Radar tracks them down and the mechanical brain computes all factors, lays the guns right on target.

It's a complex system but hardly a challenge to the Crosley background in radar and fire control, either airborne, shipboard, ground, mobile or fixed radar, and sonar.

Crosley defense production not only spans the whole field of electronics but has an equally wide spread in the mechanical and electro-mechanical fields, from components to complete weapons systems.

[redacted] Crosley has lived up to schedules on government development and production contracts—proof that Crosley does the job RIGHT and delivers ON TIME. Proof too, that the close Crosley coordination of research, development and manufacturing skills pays off fast in production of equipments and systems to meet rigid military specifications.

● "Right and On Time," an illustrated booklet describing Crosley facilities for military production, is available to Procurement Agencies and other defense contractors. Be sure to write for your copy today.

CROSLEY
GOVERNMENT PRODUCTS
DIVISION AVCO MANUFACTURING CORPORATION
CINCINNATI 15, OHIO

viously usable for such essentials as flight instruments and flight control boost, may well mean the difference between saving or losing a pilot and plane, Yardney says.

The Silvercel provides designers with two alternatives:

Either they can stay with batteries of the same size as used today and, by using Silvercels, obtain approximately three times the capacity and four to five times the maximum current drain capabilities.

Or they can reduce size and weight three to four times, retain about the same capacity and still have greater current drawing capabilities.

▶ **What Others Think**—Here are some comments on the Silvercel from well-known manufacturers of aircraft and equipment.

• The battery can be used in any installation where high electrical current storage battery is needed. . . . It can be used at —65F without external battery heat. . . . Shorting out the battery brought it up to operating conditions in 12 min. . . . The battery weighed 25 lb. compared to 131 lb. for an AN3150 battery plus its associated heating equipment.

• The battery was tested from —7F to a cell case temperature of 220F. . . . At the high temperature the plastic case warped but battery operation was unaffected.

• The battery (in a jet aircraft' "had never failed to give satisfactory starts."

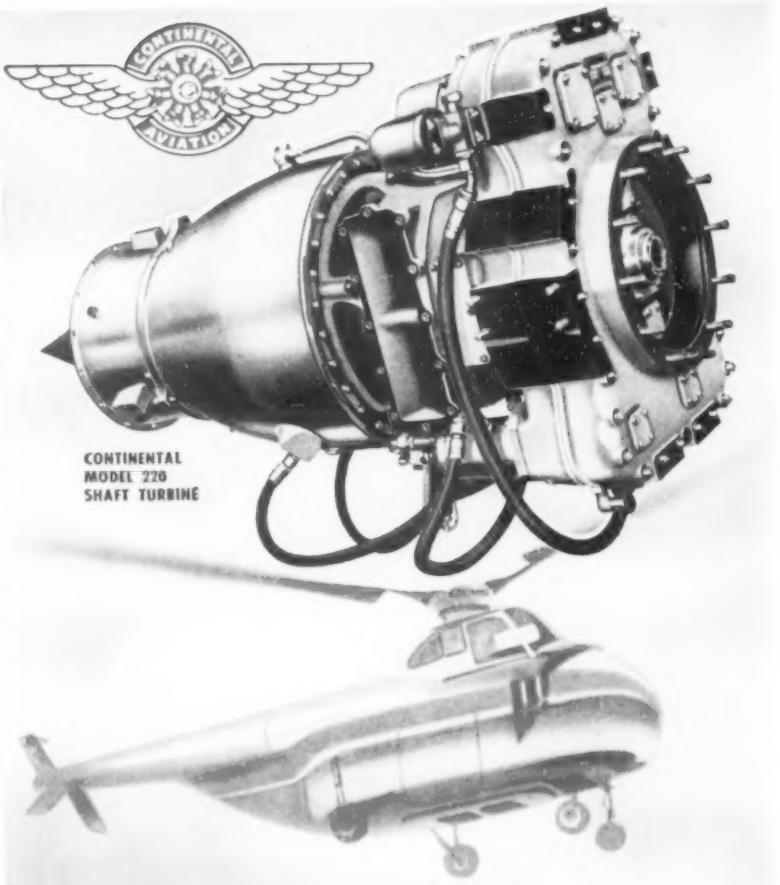
▶ **Silver Recoverable**—The current cost (of the Silvercel is approximately four times that of a comparable lead-acid battery. But, because the silver used in the units is completely recoverable, this cost could be reduced considerably under mass production conditions, Yardney officials believe.

As to the future, one of their goals is a battery with at least a two-year charged shelf life. With the recently developed, improved ion exchange separator, they are confident that this goal is well within reach.

▶ **Status Today**—With a $3-million Navy BuOrd order tucked under its belt, Yardney is stepping up production of its Silvercels. BuOrd is currently its largest customer. The battery is said to have many advantages for underwater applications.

Production for aeronautical applications is "over 20%," Yardney says. But this will increase during the current year. So will its number of employes, now 300.

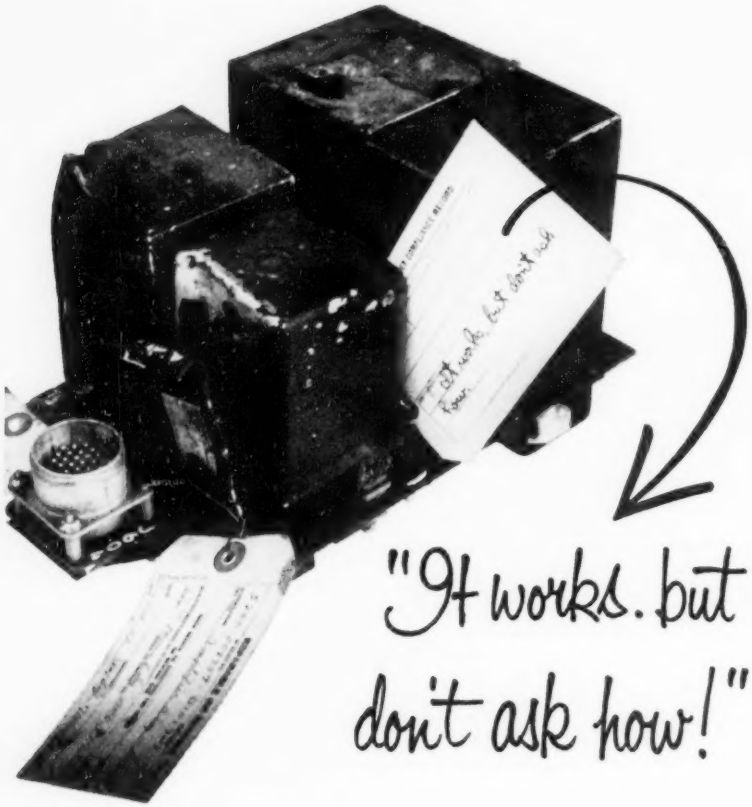
Yardney has just purchased a five-story building in lower Manhattan and will soon consolidate its activities under one roof. Its executive offices, manufacturing plant and laboratory facilities are now scattered in three different buildings in New York.



Jet power
FOR THE AIR AGE

Continental, a great name in power, offers advanced development and modern manufacture to serve those requiring turbine power plants for helicopters, fixed wing aircraft, or other applications. If you manufacture equipment with a present or a prospective use for turbines —shaft power, air generators or jets— discuss your engine problems with C.A.E.

CONTINENTAL AVIATION & ENGINEERING CORPORATION
1500 ALGONQUIN AVE., DETROIT 15, MICHIGAN
SUBSIDIARY OF CONTINENTAL MOTORS CORPORATION



That's what the Tech Sergeant wrote after inspecting this Servomechanisms, Inc. electronic computer that came out of a wrecked fighter in Korea.

The specs didn't call for operation after this kind of treatment — but we're not surprised. We build reliability and ruggedness into *all* our equipment.

SERVOmechaNISMS INC.
PACKAGED FUNCTIONAL COMPONENTS

Designed and Produced at El Segundo, California and Westbury, New York

WHAT'S NEW

New Literature

Selection of **steel casting material** is simplified with Lebanon Circle-L Slide Chart. Included in information chart gives are nominal analyses, minimum mechanical properties and heat treatment of various steel grades. Write Lebanon Steel Foundry, 53 Lehman St., Lebanon, Pa. . . . 88-page **Symposium on Fretting Corrosion** is available at $2 a copy from American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. . . . Adaptability, application and complete specifications of **rubberized abrasives** are covered in Catalog No. 53 by Cratex Manufacturing Co., 81 Natoma St., San Francisco, Calif.

How-to-do-it handbook contains 36 pages of hints for **precision cylindrical grinder users.** Available from Landis Tool Co., Waynesboro, Pa. . . . **Pyrometer Thermocouple Calibration Data**—bulletin P1259—contains tables based on data recently released by National Bureau of Standards and adopted by Scientific Apparatus Makers Assn. and Instrument Society of America. Write to Bristol Co., Waterbury, Conn. . . . Illustrated manual contains 34 pages of information on **vapor degreasing.** It is put out by Circo Equipment Co., 120 Central Ave., Clark (Rahway), N. J.

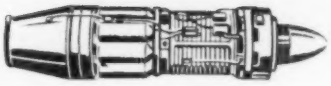
Data sheets describing company's facilities for producing **milled skins for aircraft industry** may be obtained from Franklin Balmar Corp., Woodberry, Baltimore, Md. . . . More Dollars From Less Space is Alden Systems Co.'s contribution to the **science of using plant area most efficiently.** Write the company at Westboro, Mass. . . . **Control systems for furnaces, ovens, dryers and kilns** are covered in 48-page bulletin P1260 put out by Bristol Co., Waterbury, Conn.

Publications Received

• **Helicopter Rating**—first edition by Charles A. Zweng—pub. by Pan American Navigation Service, 12021 Ventura Blvd., North Hollywood, Calif. 325 pp., plus viii. Illus. $5.00. Guide to CAA helicopter pilot ratings, with typical examination questions and answers.

• **The Aeroplane Directory of British Aviation,** Incorporating Who's Who in British Aviation, 1954 edition—Compiled by the Staff of The Aeroplane—pub. by Temple Press Limited, Bowling Green Lane, London, E.C.I. 546 pp.; 21 shillings net, approx. $3.00. Guide to aviation in the British Commonwealth, together with a biographical section containing over 1,600 entries.

BEFORE THIS JET CAN *FLY*



ITS INTRICATE FUEL SYSTEM MUST "*FLOW*"

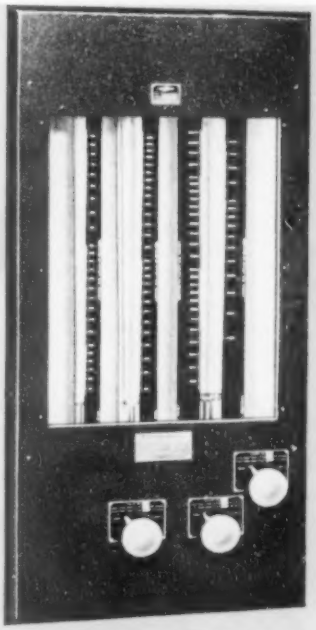
AND THAT MEANS

COX *Multiple Stage type 12* FLOWMETERS

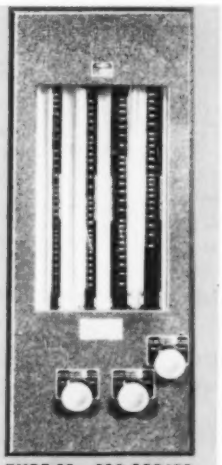
Ever stop to wonder why Cox Multiple Stage Type 12 Flowmeters are so widely used by the U. S. Airforce and U. S. Navy?

The answer is that both these services must know *exactly* how much fuel a plane's fuel pumps and fuel nozzles can handle in a given amount of time—in order to determine the operating reliability of its intricate fuel system. In jets, particularly, accurate flow rate testing is essential, since the fuel system must be capable of pumping and carrying tremendous amounts of fuel each minute the plane is in the air.

Experience has shown America's major users of precision flowmeters that the Cox Type 12 can always be depended upon for *first-rate performance*. Its record of service is unmatched in providing accurate, dependable testing of jet nozzles, fuel pumps, carburetors, and other items forming the vital "flow systems" of jet and reciprocating engines.



TYPE 12 - 90 SERIES



TYPE 12 - 100 SERIES

The Cox Multiple Stage Type 12 is available in three series—the 40, the 90, and the 100. All possess remarkable accuracy, repeatability and quick response. Maximum capacity of the *40 Series* and the *90 Series* is 36,000 pounds per hour. *The 100 Series* provides a maximum flow capacity of 32,500 pounds per hour. Use of a bypass orifice greatly increases the flow capacity of each instrument without increasing its frontal area.

Readings to the nearest graduation on individually graduated logarithmic type scales are normally within ½% to 1% of the indicated flow, depending on the particular series. Flowmeters are calibrated for a specific fluid and scales for metering liquids of different characteristics can be easily interchanged.

Patented "Inner Wall" guides, integral with the metering tube, assure a true flow pattern by keeping the float centered in the tube at all times.

COX FLOWMETERS - THE STANDARD OF INDUSTRY

1 AUTOMOTIVE AND RELATED MANUFACTURERS

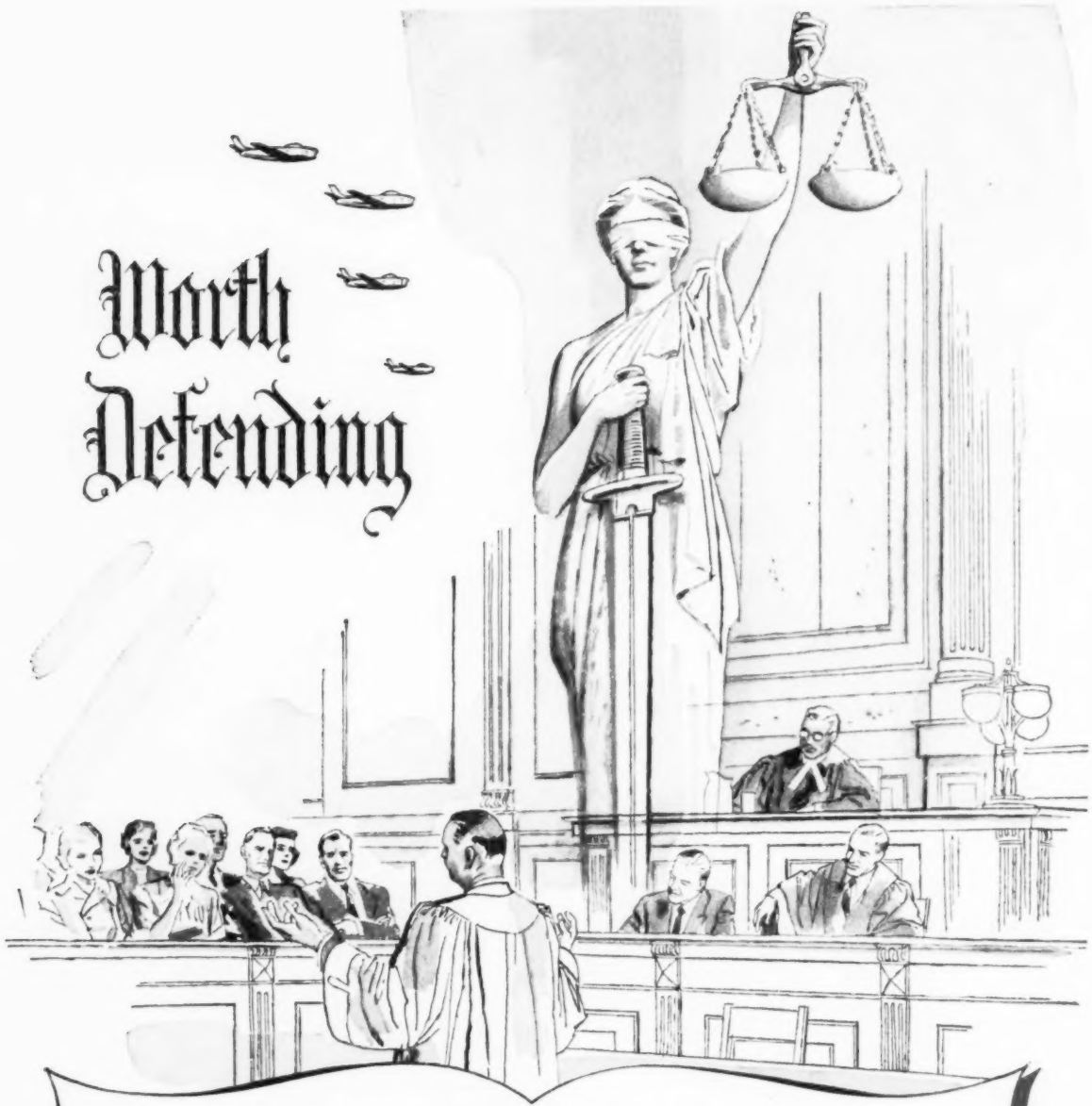
2 AIRCRAFT AND RELATED MANUFACTURERS

3 U. S. ARMY NAVY AIR FORCE

Commercial Research Laboratories, Inc.

20 BARTLETT AVENUE • DETROIT 3, MICHIGAN

MAKERS OF COX INSTRUMENTS SINCE 1912: CARBURETOR FLOW STANDS • ENGINE INDICATORS • FLOWMETER CALIBRATING STANDS FUEL NOZZLE TEST STANDS • MAGNETIC THICKNESS GAGES • VIBRATION RECORDING EQUIPMENT • BALANCED ELECTRONIC EQUIPMENT FOR PRESSURE AND VIBRATIONS



THE RIGHTS OF MAN

Courts of law should be a symbol of human rights and freedom; a symbol that has been made and still is a travesty in many parts of the world. Arrest without warrant... false confessions through psychological or physical torture... sentence without charge . . . all have come close to universal triumph *twice* in our generation.

In our way of life, a fair trial before jury and the protection of our individual rights are among our most precious possessions. It is our obligation to be ever on guard . . . for the Rights of Man are *worth defending!*

CA54-9US7

C-L CANADAIR LTD.

CANADAIR

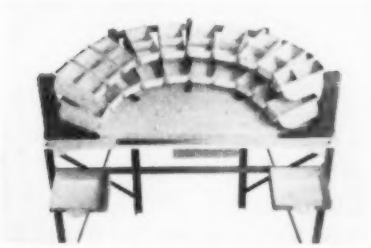
— AIRCRAFT MANUFACTURERS —

LIMITED, MONTREAL, CANADA

One of a series dedicated to the survival of freedom — Reprints on request.

A subsidiary of GENERAL DYNAMICS CORPORATION, New York, N.Y. — Washington, D.C.

NEW AVIATION PRODUCTS

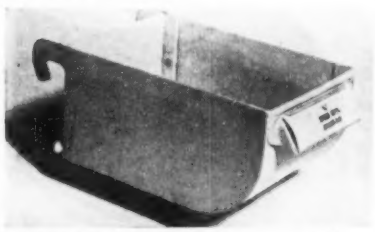


SEMI-CIRCULAR unit speeds assembling.

Bin System Simplifies Small-Parts Handling

Small-parts storing and handling are simplified with a new bin system developed by Service Parts Systems, Inc.

Removable containers are hooked onto storage racks which come in various sizes and shapes, both fixed and portable. When the containers are empty, they may be removed and replaced with full ones. Or when short production runs require frequent changes of assemblies it is simple to substitute containers with new parts for the old ones.



STORAGE container tilts on parts rack.

The containers have rounded bottoms to make it easier to pick out parts. They are tilted in the racks for good visibility of the contents. Individual racks hold as many as 200 containers. By placing a number of units end to end in a row, a large number of different parts may be stored in little space, the maker says.

Service Parts Systems, Inc., P. O. Box 243, E. Detroit, Mich.

Midget Punch Press Is Precision-Built

Precision-built, midget punch press is being put on the market by Kenco Manufacturing Co.

The 1½-ton unit follows general lines and specifications of the company's 4- and 5-ton presses. It features a solid crankshaft of alloyed steel, roller bearing-mounted flywheel, clutching mechanism self-contained and independent of crankshaft, alloyed steel drive collar,

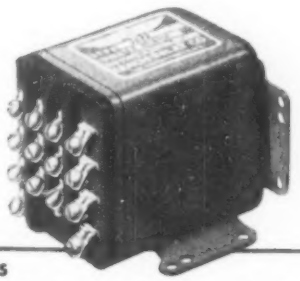
Leach

CONTROL RELAYS

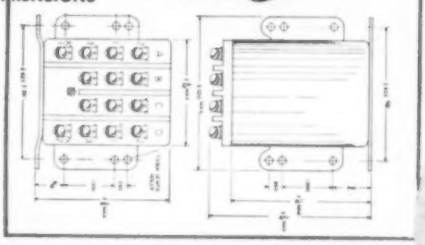
FOR *UNEXCELLED* PERFORMANCE

Furnishing Relays that excel in performance is a *Leach* specialty. Their rugged strength and smooth endurance provide uniform control, protection and dependability.

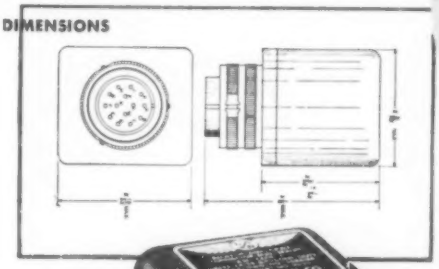
No matter what your Relay application, we invite you to share our nearly four decades of experience and facilities as designers, engineers and manufacturers of a complete line of relays.



DIMENSIONS



DIMENSIONS



CHARACTERISTICS

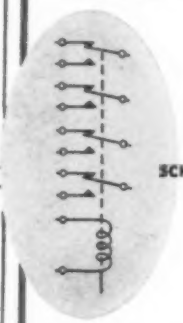
Leach Part No. 9072 Hermetically Sealed, Screw Terminals.

CONTACTS:
Arrangement—4 Pole, Double Throw. Rating—10 amps resistive and inductive at 29 v d-c, 6 amps motor load at 29 v d-c, 10 amps resistive at 115 v a-c, 400 cps.

COIL: 135 ohms, 28 v d-c.

WEIGHT: .70 lb.

Also available with Solder Terminals —Leach Part No. 9039SS.



SCHEMATIC

Leach Part No. 9039 Sealed AN Connector Mounting. Same Characteristics as above.

APPROVED:
AN3310-1 part per spec. MIL-R-6106

WEIGHT:
.57 lb.

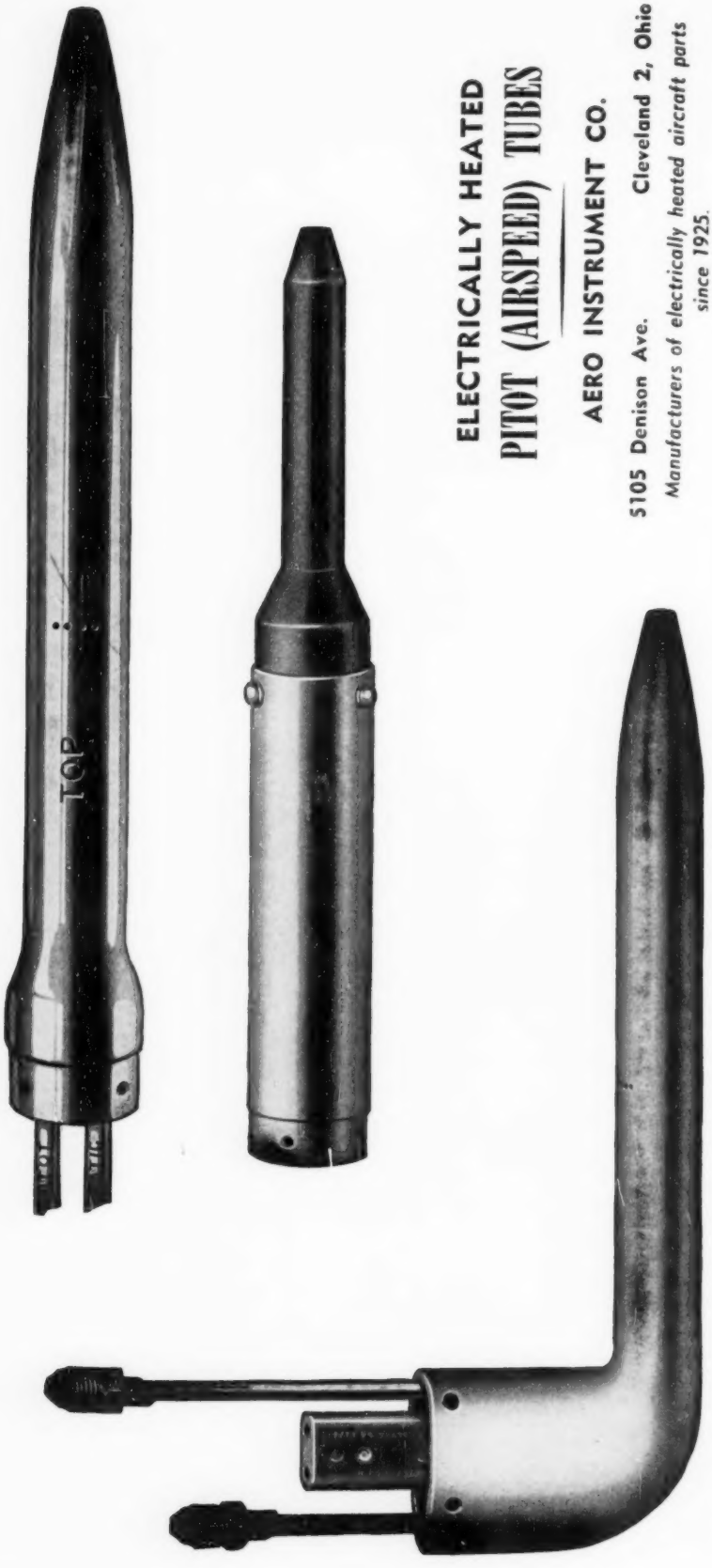
Hermetically Sealed and Sealed — Midgets — Circuit Controls — Aircraft Relays & Contactors — Special Purpose — Radio & High Frequency — Keying

For your specific requirements and for BETTER CONTROLS THROUGH BETTER RELAYS—*Contact Leach*

LEACH RELAY CO.

5915 AVALON BOULEVARD • LOS ANGELES 3, CALIFORNIA

Representatives in Principal Cities of U.S. and Canada



alloyed bronze connecting rod and crankshaft bearings and 90-deg. V-type ram and ram guides. The frame is of special alloyed casting structure, precision-machined for accuracy.

Standard stroke is ¾ in., with 1 in. optional at extra charge. Press is open-back and inclinable.

Kenco Manufacturing Co., 5211 Telegraph Rd., Los Angeles 22.

Flat-Angle Drill for Close-Quarter Work

Aro Equipment Corp. has developed an air-powered flat angle drill that features a small head for working in close quarters, plus heavy-duty bevel gears to increase the tool's life.

The company says it was able to decrease size where needed at the drilling end by relocating the bevel gears to the rear end of the housing, a change that permitted use of more rugged gears than in former designs.

In the angle head, precision gears are mounted on needle bearings.

Aro reports new materials in the drill also increase tool's strength and life:

- **Ductile cast iron** is used in the right-angle assembly.
- **Heat-treated steel alloy** with graphitic type features is used on the cover plate of the drill's iron casting assembly.

Head height of the new drill is 1⅞ in., a reduction of ⅝ in. in the standard size. Spindle offset is ⅞ in., and overall length for Model 7438 totals 10⅞ in.

Tool components are interchangeable for speed conversion, with models available for 1,450, 2,100, 2,500 and 4,000 rpm.

Aro Equipment Corp., Bryan, Ohio.

ALSO ON THE MARKET

Duo-Seals, one-piece washer-and-rubber "O" ring combinations, reportedly provide leak-proof sealing against fluids, gases or air, around bolts where they go through walls, bulkheads or skins retaining such fluids or gases. Units are available in ⅜ in. to ⅝ in. nominal bolt diameter.—Rubber Teck, Inc., 19115 S. Hamilton St., Gardena, Calif.

Glass-braided lead wire for electronic and electrical components operating at temperatures from —55C to 200C incorporates primary conductor insulation of Teflon for high dielectric strength, low power factor, high insulation resistance and a low dielectric constant. Secondary insulation of Teflon-impregnated glass braid reportedly affords unusual resistance to abrasion. Product is known as Tempclad.—Hitemp Wires, Inc., 26 Windsor Ave., Mineola, L. I.

Longer Hydraulic Fluid Life Means Lower Operating Costs

Fire-Resistant SKYDROL Combines SAFETY-ECONOMY

Since passing its first CAA test 5 years ago, Skydrol remains the only fire-resistant hydraulic fluid with CAA approval. Airline acceptance of Skydrol has been phenomenal... 19 major companies* are using it today. Some reasons why:

Safety. Skydrol has logged 2½ million flight hours and has never been implicated in an aircraft fire.

Economy. For example: Skydrol is approved for 4000 hours in Douglas cabin superchargers against mineral oil's 250 hours . . . *a specific service-life advantage of 16 to 1!*

Pumps last longer with Skydrol. Maintenance records show up to 34% longer actual service life . . . with component overhaul costs reduced as much as 20%.

Lubricity. Noncorrosive Skydrol does not harm metal parts . . . its lubricity factor remains constant even after extended use.

Low Cost Conversion. You'll be surprised . . . it costs very little to convert your aircraft to Skydrol. Write us for information.

Write for Skydrol booklet—Organic Chemicals Division, MONSANTO CHEMICAL CO., Box 478, St. Louis, Missouri.

Skydrol: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS—PLASTICS
SERVING INDUSTRY...WHICH SERVES MANKIND

*American, United, Panagra, National, Braniff, Delta-C&S, Northwest, Swissair, Western, Continental, KLM, PAA, PAL, LAI, CMA, JAL, ANA, CPA, Slick-Flying Tiger. (Four more airlines have specified Skydrol in equipment now on order.)

Utmost Strength in an Emergency

The New Pacific HARNESS REEL

Conforming with Type MA-2 of MIL-R-8236 (USAF)

The new Pacific Harness Reel incorporates an entirely new principle of operation as well as being designed to meet the strength requirements shown necessary by high speed jet aircraft and aero-medical analysis of crashes.

The reel easily withstands an ultimate load of 4,000 pounds and at the same time is lighter, smaller, and much more versatile in installation. Pilot is protected against being thrown in any direction and the reel instantly locks upon uncontrolled acceleration of the pilot, yet the reel permits comfortable movement in performing regular duties.

Write for New Bulletin

Pacific SCIENTIFIC CO.

1430 Grande Vista Ave., Los Angeles 23, Calif.
25 Stillman Street, San Francisco 7, California
1915 1st Avenue South, Seattle 4, Washington
111 B East Main Street, Arlington, Texas
Eastern Representative: Aero Engineering Inc.
Mineola, L.I., N.Y. • Indianapolis • Baltimore • Ottawa

Aircraft Earnings Go Up Again

High sales volumes in 1953 take sting out of drop in profit margins in recent years, bank study indicates.

The aircraft industry in 1953 went on to a new peak earnings for one of the best years in its history. This is spotlighted in the separate reports released by the individual companies for last year and by the summary compilations gathered by the National City Bank.

The annual review of corporate reports by the National City Bank has become a recognized source in measuring earnings and profitability for all industry. In 1953, it covered 3,444 companies.

The aircraft group—34 companies, representing prime builders and parts manufacturers—chalked up $168 million in net income after taxes for 1953, a net gain of 32% from $127.2 million for 1952. Very few other industrial groups exceeded this percentage gain. All manufacturing companies (a total of 1,781 corporations) averaged a 9% increase in net income for 1953 over the previous year.

► **Long-Term Trend**—More impressive is a longer-term view of aircraft earnings covering the trend for the past six years. National City Bank compilations covering this period have been reviewed and are presented in the table below.

From net income of only $17.7 million (for 27 companies) in 1948, consistent and rapid increments have taken place, to the extent of a ninefold gain by 1953.

► **Profitability Rate**—Despite the heavy hand of excess profit taxes in 1953, the aircraft group retained the same average net profit margin on sales, 2.4%, as in 1952.

The average profit margin was lower last year than for 1950 and 1949, but far greater volume in sales more than compensated for declining profit margins in recent years.

Nevertheless, the average rate of profitability for the aircraft group is considerably lower than for all manufacturing enterprises. For 1953, a total of 1,781 companies averaged a 5.3% net profit margin.

► **Capital Investment**—The aircraft group reveals constant additions to its plant, property and equipment accounts. At Jan. 1, 1953, book net assets were valued at almost $800 million—an all-time high—and no doubt further additions were made during the year.

The trend in book net assets for the past six years reveals convincingly that the aircraft industry has and does make capital expenditures for fixed-asset additions. By no means, have all its facilities been obtained under government lease.

The book valuations shown, however, are subject to many qualifications: retirements, property completely written off the books but still utilized, and above all the necessity of replacement of equipment at substantial increases in capital outlays over present book value.

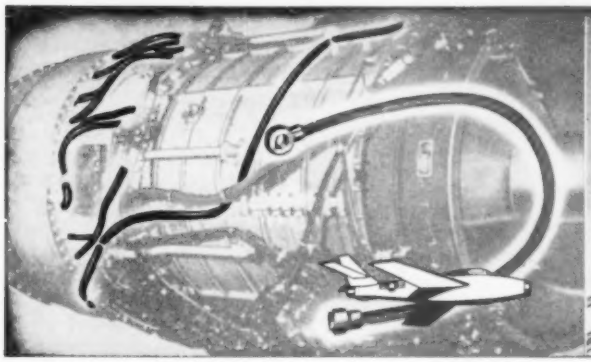
In other words, technological ad-

The Climb in Aircraft Earnings

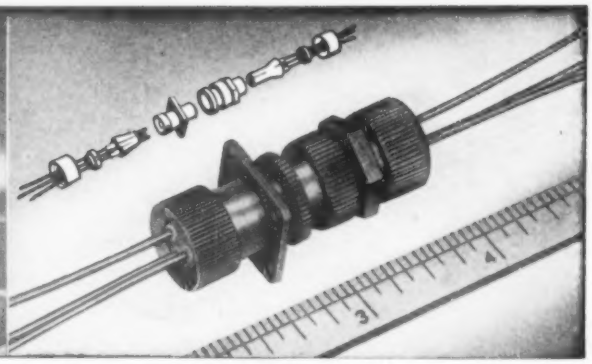
	1948	1949	1950	1951	1952	1953
Number of companies*	27	27	29	33	37	37
Reported net income after taxes (000)	$17,721	$47,370	$84,585	$62,679	$127,167	$167,981
Book net assets, Jan. 1 (000)	$601,773	$580,594	$592,613	$686,747	$712,084	$799,539
Percent return on sales	1.4	3.3	4.5	2.2	2.4	2.4
Percent return on net assets	2.9	8.2	14.3	9.1	17.9	21.0

* *Prime builders and parts manufacturers.*
SOURCE: National City Bank Letters, National City Bank, New York.

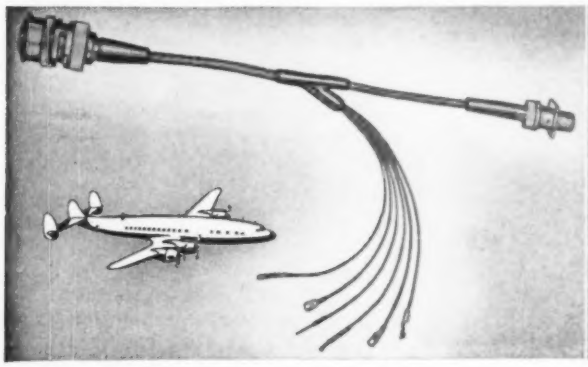
Four design ideas you can use right now...



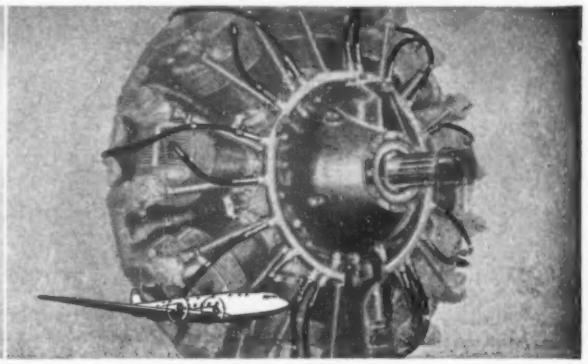
DEPENDABLE FUEL FEEDING. Fuel for the J65 Turbojet Engine is injected to the burners through Titeflex® flexible metal hose. Tough, lightweight Titeflex—tested for temperatures from —70°F. to +600°F. and for pressures up to 500 psi—reliably conveys fuel to engine nozzles; withstands vibration and rough use; is excellent for complex configurations.



FAILURE-FREE INSTRUMENTATION. Designed primarily for instrumentation service at high altitudes, lightweight Titeflex 07 Connectors are pressure-tight and resistant to moisture and corrosion. Plug and receptacle, mated, weigh only ⅗ of an ounce! Special sizes, meeting AN Specifications, can be made with 2 or 3 pins and AE threads—and adapted to your design.



CUSTOM WIRING SYSTEMS. Titeflex specializes in designing and building special "packaged" wiring systems and component assemblies for today's complex aviation and guided missile installations. These may be jacketed with protective silicone or other compounds—and Titeflex Special Connectors used as integral parts solve complex wiring problems.



RADIO SHIELDING. Titeflex Harness for reciprocating engines is our specialty. Titeflex makes a wide range of standard ignition harnesses meeting rigid aviation specifications—can also supply component parts, such as serviceable leads for military and commercial aircraft. Titeflex application on Wright R 1820 Engine includes harness and leads.

FROM DESIGN TO FINISHED PRODUCTS, Titeflex is especially well qualified to help you with all problems of special metal hose, wiring and connections. Take advantage of the long experience of Titeflex engineers in developing high temperature fuel lines, in designing and fabricating harness and wiring systems. Write us now about your application; our nearest representative will be glad to call and help you. Or send for our *new 48-page Metal Hose Catalog* No. 200.

Let Our Family of Products Help Yours

Titeflex

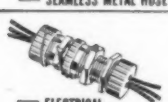
✓ Check products you are interested in.

☐ SEAMED AND SEAMLESS METAL HOSE

☐ PRECISION BELLOWS

☐ IGNITION HARNESS

☐ IGNITION SHIELDING



☐ ELECTRICAL CONNECTORS

☐ RIGID AND FLEXIBLE WAVE GUIDES

☐ WIRING SYSTEMS

☐ FUSES

TITEFLEX, INC.
517 Frelinghuysen Ave.
Newark 5, N.J.

Please send me without cost information about the products checked at the left.

MAIL COUPON TODAY

NAME _____

TITLE _____

FIRM _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

BLOWERS

light...compact...dependable

GLOBE miniature fans and blower units provide the answer to air movement where light weight, small size and maximum dependability are required. They are powered by custom built and quality controlled Globe D.C. or 60 and 400 cycle A.C. "Moto-Mite" Motors; characterized by high output and high efficiency. Capacities of axial types of different sizes up to 50 C.F.M., and up to 0.8 in. H_2O back pressure. Air flow in either direction. Designed to meet military specifications. Weights from 9½ oz.

We invite you to utilize Globe's specialized experience in the development and application of miniature motors and motor products. Complete details and engineering assistance available . . . WRITE TODAY!

Globe industries, inc.

MOTORS • GEAR REDUCERS • GENERATORS • GOVERNORS • SERVOS
BLOWERS • FANS • ACTUATORS • SWITCHES • GYROS • VIBRATORS
1802 STANLEY AVE., DAYTON 4, OHIO

vances and the willingness of the aircraft industry to operate with the most advanced type of equipment available dictate capital expenditures much greater than provided by depreciation reserves accumulated in past periods.

For this reason, measuring profitability on static net book valuations may not always prove very reliable.

► **Return on Book Value**—It is interesting to observe that, based on book net asset valuations as compiled by the National City Bank, the aircraft group showed a net return of 21% in 1953 as against 17.9% in 1952 and only 2.9% in 1948.

The aircraft group's return on book net assets was the highest for any of the separate industrial categories shown in 1953. All manufacturing companies averaged a 12.5% return on their book valuations last year. It is also noteworthy that while all industry increased its book net assets by 6.8% last year, the aircraft industry added to its facilities on the same basis by 12.3%.

► **Excess Profits**—During 1953, excess profits taxes took a heavy toll of aircraft earnings. The effective tax rate for most major companies was close to 70%. (Neither Martin nor Beech paid EPT, Martin due to previous tax credits, and Beech because of a deficit due to special writeoffs.)

For those companies not on a calendar-year basis, some remnants of the EPT will be felt even in 1954. For example, a company with fiscal year ended Sept. 30 will be subject to this added impost for a three-month period. But it will be averaged out over its entire year.

There is no doubt that the removal of excess profits taxes should be beneficial to current aircraft earnings. Certainly, net profit margins on sales for 1954 should be no lower than the average 2.4% shown for 1953 and 1952. If anything, prospects would favor some improvement in this profit margin.

Ultimate results will, of course, be influenced by the course of contract price redeterminations and subsequent renegotiation. But renegotiations will come two or more years after sales and earnings are recorded for 1954. So adjustments, if found necessary, may have the nature of a delayed reaction.

Despite this qualification of 1954 operations, the aircraft group should again enjoy a profitable year. Volume deliveries should remain high. For the group as a whole, net earnings may at least equal 1953 results, with conditions favoring a new high.

Not all companies will participate uniformly in this profitability, however. Selectivity in earnings, very pronounced during 1953, will become even more so in 1954. —**Selig Altschul**

It's Wilcox VOR
For Improved Safety and Regularity of Operation Under Adverse Weather Conditions

Complete stations are available with 50 or 200 watts output, single or duplicated, manual or automatic changeover, local or remote control.

Wilcox supplies the prefabricated shelter, antenna and all electronic equipment—nothing else to buy.

Two years of engineering development has made possible a VOR of extreme accuracy and reliability, meeting all provisions of ICAO, Annex 10.

The Wilcox design offers low initial cost, rapid installation and minimum maintenance.

Write now for our technical data and full information.

wilcox
ELECTRIC COMPANY, INC.
Fourteenth & Chestnut
Kansas City 27, Missouri, U.S.A.

RYAN FIREBEE

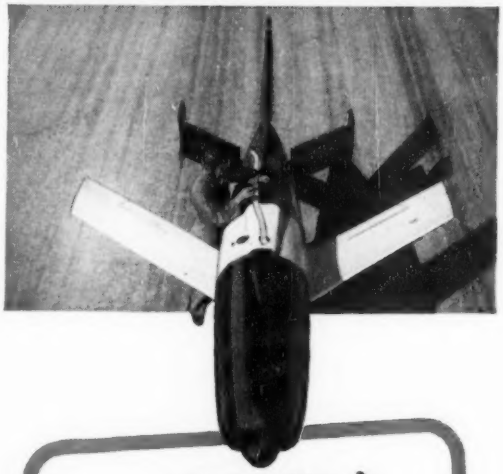
...it lives fast and dangerously!

To keep our air and ground defenders' shooting sharp is the job of the Firebee, America's new high-performance pilotless jet plane. A product of Ryan Aeronautical Company's advanced aeronautical engineering, the Firebee was developed as a joint project of the U. S. Air Force, Army and Navy. It is now being manufactured for use by all three services.

The Firebee carries no human pilot, yet this remote-controlled target plane has phenomenal performance like a modern fighter. It is launched either from the ground or from a "mother" plane and is recoverable by a highly efficient parachute system that lowers it gently to the ground.

Design and development of the Firebee demanded the highest level of scientific talent and technical ability—in the aerodynamic, structural, mechanical, metallurgical and electronics fields. In this latest proud accomplishment, Ryan drew on rich experience gained through its 31 years in the forefront of aeronautical progress.

Because Ryan is *specialized, ingenious* and *versatile* . . . because it is an integrated company with superior abilities in many specialized fields, Ryan is better prepared to accomplish the unique, difficult technical engineering and production assignments of today's high-speed air age.



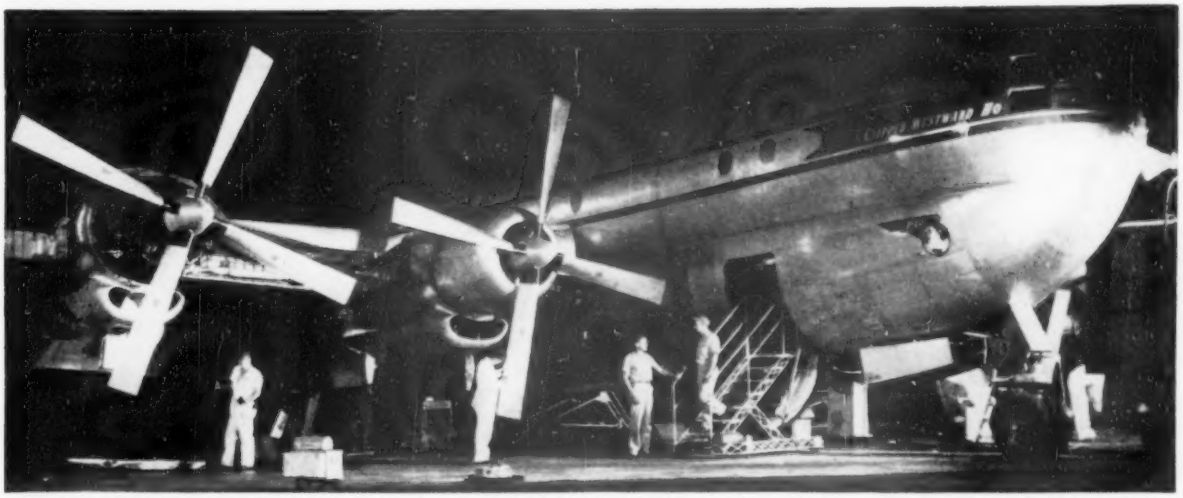
RYAN

★ SPECIALIZED
★ INGENIOUS
★ VERSATILE

Advanced-type Aircraft and Components
Jet and Rocket Engines and Components
Exhaust Systems for Aircraft
Electronics Equipment
Ceramics for "Hot Parts"
Weapons Systems Design and Management
Aircraft and Power Plant Research
Metallurgical Engineering
Thin-Wall Ducting
Firebee Pilotless Jet Planes

Pioneers in Each ★ Leaders in All

RYAN AERONAUTICAL COMPANY • Factory and Home Offices, Lindbergh Field, San Diego 12, Calif.
OTHER OFFICES: WASHINGTON, D. C.; DAYTON, OHIO; SEATTLE, WASHINGTON; NEW YORK CITY



TAKING TIME OFF from the job of coping with busy schedules, Boeing Stratocruiser undergoes maintenance at PAA's Miami base.

PAA Rides Aircoach Boom to New Peaks

- **U. S.-flag line carries record number of passengers to and from America, widening lead over competitors.**
- **Tourist-class traffic accounts for nearly half of total sales, is expected to increase by 50% this year.**

By Frank Shea, Jr.

International aircoach travel is booming, and Pan American World Airways—early pioneer and staunchest supporter of low-fare international service—is making the most of it.

Last year, widening its lead over all competition in transportation of passengers abroad, PAA carried 28% of all overseas traffic to and from the continental U. S. for a record total of 1,657,000 passengers. Aircoach travel accounted for 41% of passenger revenues.

This year, the company expects an even greater increase in passenger traffic, with aircoach again playing a major role. Willis G. Lipscomb, vice president for traffic and sales, forecasts a 10% increase in overall traffic with a 50% jump in tourist sales.

▶ **Beating the Record**—New highs are predicted for almost all categories. This would mean beating these record figures of last year:

- **Net income** hit $10.8 million, a jump of more than $4 million over 1952.
- **Gross revenues** climbed to $217.9 million, excluding the operations of Panagra and affiliated airlines.
- **Operating revenues** increased by 6.2%, while operating expenses went up only 1.5%.
- **Costs** per available ton-mile dropped from 45.2 cents to 42.4 cents.
- **Dividends** paid out totaled $3.9 million or 65 cents per share, compared with $3.07 million or 50 cents per share in 1952.
- **Air cargo** totals led all other international carriers, with 50.4 million ton-miles flown.

Of the 1.6 million passengers carried last year, Atlantic traffic accounted for 127,558. This was 27.7% of the total number of passengers carried to and from the U. S. by all scheduled trans-Atlantic airlines.

Pan American also maintained its leadership in the Pacific and Latin America. Pacific traffic to and from the U. S. was up 42.1% over the previous year, and one out of every two passengers going between the U. S. and Latin America flew with PAA.

These are records that will be hard to beat, but management is confident this year will be even bigger.

▶ **Low Fares**—The key, says Pan American, will be continuance of the proven successful policy of "bringing interna-

TOURIST CUSTOMERS bound for Hawaii board a PanAm Stratocruiser on the West Coast.

TRIPPE: Make the most of coach.

tional air travel within reach of the lower income groups by making it available at the lowest possible fares."

In keeping with this policy, PAA has made the following implementations in its tourist service since last year:

- Extension of aircoach flights from Europe to India.
- Inauguration of tourist service on Pacific routes.
- A 40% increase in trans-Atlantic coach flights.
- Introduction of direct service from Chicago and Detroit to Europe.
- Addition of direct one-plane service to Germany and the Scandinavian countries.
- Introduction of the "pay later" plan.

The inauguration of tourist flights on the Pacific routes is considered particularly significant since it was the last link in PAA's globe-circling route without tourist service. Now a passenger from any of the West Coast cities is able to fly completely around the world, by the most direct route and with stopover privileges, for $1,347.85. First-class fare for the same run is $1,794.55.

The heavy increase in trans-Atlantic aircoach service is based on forecasts for a record season for travel to Europe, with more than 500,000 Americans expected to visit the continent. Short vacations and limited funds will be inducements for a great number to make the trip by air, especially aircoach, reasons PAA.

Inauguration of direct service from Chicago and Detroit is expected to develop potential sales from the midwestern states, an area heretofore relatively untapped, airline officials state.

Big revenue producer is expected to be the recently introduced "pay later" plan (AVIATION WEEK, Apr. 12, p. 18), whereby passengers are permitted to pay for aircoach tickets on an installment basis, much the same as for many other consumer items. Since it is a relatively new experiment, it is not figured in PAA's overall traffic increase forecasts for the year, but officials estimate that the pay later plan alone should account for a 25% boost in sales.

▶ **First-Class Campaign**—"But all this doesn't mean that we're de-emphasizing our first-class service," says Lipscomb. "We fully expect that first-class passengers will account for about 44% of our overall traffic total for the year."

By way of pointing up its continuing interest in first-class traffic, Pan American is offering a new luxury feature this year in the form of private staterooms on trans-Atlantic flights.

Carrying a surcharge of $125, these staterooms will be available for single occupancy when two first-class fares are paid. Features include fully reclining lounge chairs, leather-covered divan, private toilet facilities and many other "luxury" items. In addition, stateroom passengers have a choice of menus, may have meals served at any time and board the aircraft ahead of all other passengers at departures and enroute stops.

▶ **Cargo Changes**—Pan American has introduced changes in cargo procedures too. Now, since introduction of a reservation system for cargo, shippers may reserve space for goods on aircraft in exactly the same way as passenger space is reserved.

In addition, an increased number of flights has been added with more on the way.

President Juan Trippe says the total cargo-carrying capacity of the PAA fleet will be increased by one-third during the year.

▶ **Fleet Orders**—Equipment-wise, the company has seven Douglas DC-7Bs on order for delivery sometime next year.

Although PAA has a standing order for three de Havilland Comet 3 jet transports, management indicates they are keeping a close watch on jet transport developments in this country, centering on the Boeing 707, Lockheed's 193 and the Douglas DC-8.

Big factor with respect to the Comet 3 order will be Civil Aeronautics Administration certification.

ATA Scores Airline Subsidy Cut Proposals

Airline subsidies are $80 million annually—not $170 million, Earl D. Johnson, Air Transport Assn. president, states in a letter to Roswell Magill, chairman of the Committee on Federal Tax Policy.

The committee's recent study of federal finances said the government could save considerable money by withdrawing or reducing $170 million of subsidies for airlines.

▶ **Airways Cost**—Johnson calls this "a disturbing note in an otherwise carefully organized report."

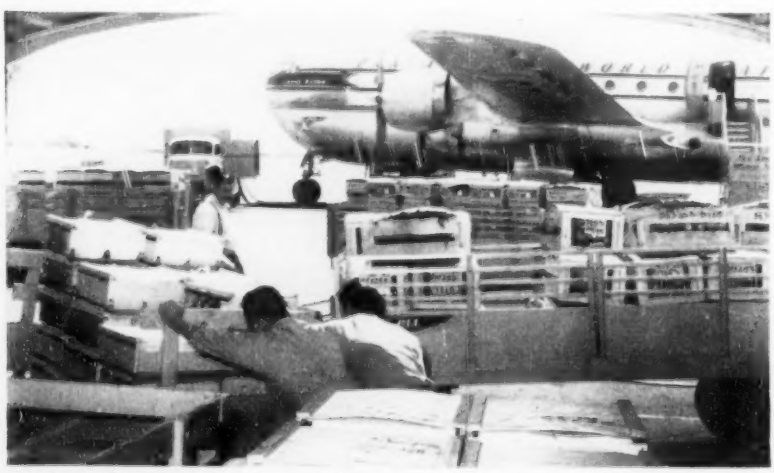
Air carriers "benefit from postal subsidies of $80 million over and above the payments for transporting the mail," he says.

"However, you have apparently fallen into the error of accepting as subsidy to the airlines all of the cost of the federal airways. It should be pointed out that the $90 million over and above the amount allocated as mail subsidy includes the cost of facilities in Alaska, the Pacific Ocean and the Caribbean, where airline use frequently is subordinate to military and the national defense.

"But of even more importance is your apparent assumption that the entire cost of the federal airways should be charged to the scheduled airlines. Actually . . . the domestic scheduled airlines' share of the cost of the federal airways is about $12 million."

▶ **'Unrealistic' Plan**—"Currently this industry is paying more than $15 million a year in gasoline and oil taxes alone," the ATA president says. "We therefore believe we receive no subsidy from the federal operation of airways facilities."

Johnson describes as "highly unrea-



CARGO SHIPMENTS get space reservations in same manner as passengers under new setup.

listic" any proposal that the airways be turned over to private ownership and operation.

"It is unfortunate," says Johnson, "that the Committee on Federal Tax Policy apparently thinks that the federal government can drop the expense of its airways system, as strongly implied by your inclusion of airways expenditures in the section dealing with areas 'ripe for curtailment or complete elimination.'"

"The complete airways system is absolutely necessary for military operations and if the Civil Aeronautics Administration were unable to pay for it the Air Force and other military branches would be forced to do so."

N.Y. Breaks Ground For Airline Terminal

Ground has been broken for New York City's West Side Airlines Terminal.

Major lessee of the structure, scheduled for completion early next year will be the West Side Terminal Corp.—a company wholly owned by American, Eastern, National, Northwest, Trans World, Allegheny, Mohawk and United Air Lines.

Once the terminal is completed, bus running time to Newark Airport via the Lincoln Tunnel and the New Jersey Turnpike will be reduced to about 25 min. Present Newark passengers must use the East Side Airlines Terminal, which means a time-consuming cross-town trip in the city.

The building will consist of four stories, with a basement garage for 175 cars. On the ground floor will be spacious public areas, 250 lineal ft. of airline ticket counters, a bank, restaurant and bar, shops and a balcony on three sides of the lobby.

American's reservations headquarters will be located on the third floor. Remaining space will be devoted to offices and passenger and baggage handling facilities. Loading and unloading of airport buses will be conducted on the premises.

Nonsked to Appeal CAB Shuttle Ruling

North American Airlines planned an appeal to Civil Aeronautics Board last week for reconsideration of CAB's denial of the nonscheduled line's proposal to operate shuttle aircoach service between New York and Washington, D. C.

The airline wants to provide less expensive service between the two cities, flying 80-passenger DC-4s and selling tickets aboard the aircraft.

Scheduled International Civil Air Transport Development

(In millions)

	Miles flown	Passengers carried	Passenger-miles	Cargo ton-miles	Mail ton-miles
1947	708	21.0	11,740	286	88
1948	789	23.5	12,990	286	114
1949	836	26.5	14,480	390	128
1950	890	31.2	16,960	518	143
1951	976	39.9	21,380	612	160
1952	1,059	45.0	24,540	651	175
1953	1,170	52.0	28,580	700	185

Exclusions: China and USSR.
Source: ICAO

World's Airlines Set Safety Record

U. S. skeds also chalk up low-fatality record; carriers of ICAO member nations show passenger traffic gains.

Airlines of International Civil Aviation Organization member countries set a new safety record of 1.36 fatalities per 100 million passenger-miles flown in 1953. This was 22% lower than in 1952. The airlines flew 52 million passengers during the year.

U.S. scheduled airlines carried 31.5 million passengers with .48 fatalities per 100 million passenger-miles, Air Transport Assn. reports.

▶ **Traffic Increases**—In a year-end report for the eighth ICAO assembly meeting at Montreal in June, the international organization states that, exclusive of China and the USSR, airlines of member nations flew a total of 28,580 million passenger-miles during the year.

Passenger traffic increased 16.5% above 1952. Average percentage of annual increase in traffic since 1947 has been 16%. Load factors decreased slightly from 59.8% in 1952 to 59.3% in 1953.

"The extent to which tourist traffic is responsible for the maintained rate of growth is problematic; 1953 was the first year in which tourist operations may be said to have approached the natural level in the international field," ICAO reports.

"It is highly probable that the large volume of tourist travel on the long flight across the North Atlantic was the major factor causing the average distance traveled by airline passengers to rise in 1953 for the second consecutive year."

▶ **PAA Leads**—The report says Pan American World Airways, which flies more traffic internationally than any other airline, carried more passengers on tourist flights than on other flights. PAA aircoach passengers accounted for 870,000 or 53% of all its passengers.

North Atlantic air passengers alone reached an estimated 510,000. Of this number, 60% flew tourist class. However, ICAO points out, "this is far short of the estimated 900,000 that crossed by sea."

▶ **Cargo Lags**—International cargo traffic increased 7.4% and mail 5.5%. Low rate of increase in airmail is due, says the report, to the fact that more than two-thirds of all first-class international mail now apparently moves by air. Secondly, high cost of airmail compared with regular mail is seen as a deterrent.

Rate of increase of cargo traffic on scheduled air services is below that of passenger traffic for the past three years. During the last two years, it has been less than half as great. Between 1947 and 1950, the rate of increase was between two and five times as great as that for passengers, ICAO reports.

▶ **Revenues**—Financially, only 1952 figures are available at present. That was the first year that estimated operating revenues of the airlines exceeded $2 billion.

Revenues totaled $2,109 million; op-

Revenue Climb

(In millions)

	Operating revenues	Operating expenses
1947	$1,050	$1,170
1948	1,348	1,397
1949	1,398	1,406
1950	1,543	1,502
1951	1,880	1,774
1952	2,109	2,035
1953*	2,383	2,356

* Preliminary estimates.
Source: ICAO

erating expenses were $2,035 million for the period.

This is a 12.2% revenue increase over 1951 and 14.7% for expenses. Passengers contributed 73.5%, cargo and mail about 22.4% and charter services and incidentals about 4.1% of the total revenue.

ICAO says "operating figures for 1953 indicate a slightly less favorable picture than for 1952." Best estimates available are that revenues amounted to approximately $2,383 million, an increase of 13% over 1952. Operating expenses were $2,356 million, an increase of 15.8%.

Shift to Coach

- **Eastern begins increased low-fare operations.**
- **Rickenbacker forecasts 65% tourist service.**

Eastern Air Lines starts next week on what it expects to be a continuing swing to increased coach operation on a system-wide basis.

About half of EAL's entire service will be coach after May 16, when day and night tourist flights to trunkline points are added as summer schedules become effective. Right now the proportion of coach to first-class is less than a fourth.

Sixteen Lockheed Super Constellations, until now in first-class operation, will be "injected" into Eastern's 14,000-mi. system to increase the number of day and night coach flights from 22% to 50% of the total. Conversions will expand seat capacity from 88 to 98 in some of them.

▶ **More Later**—Capt. Eddie Rickenbacker, chairman of Eastern's board, sees the step as a beginning. He told reporters at a press conference he believes that by the end of next year 60% to 65% of the line's operations will be coach.

He expects the increase to be steady, without retrenchment when winter schedules are resumed next fall. No curtailment of first-class flights, he says, will accompany the current increase in coach service.

"We won't make the money we made a year ago," he comments, "but we hope for a reasonable profit." Eastern, he says, has a record of 18 years "in black ink."

The line operates 270,000 plane-miles every 24 hr. with 276 flights daily. Its position among the "Big Four" scheduled air carriers lends the move particular significance.

▶ **Readjustment**—Rickenbacker explains the step to get a bigger chunk of the mass transportation market as a "broad commercial readjustment"—part of a move to meet the "philosophy and psychology of the times."

First-class air service, he says, has been meeting the public's desire for "more for the same money," while coach service provides the "same for less money."

He characterizes the difference between the two types of accommodation as primarly one of cost.

▶ **Capacity Boost**—Rickenbacker's aides list some statistics to show the increased services will provide capacity for about 1.5 million aircoach passengers annually, compared with 3.475 million carried by the entire air transport industry in 1953.

They will give EAL daily aircoach capacity for 4,072 passengers (plus extra sections), with 5,250,000 aircoach seat-miles scheduled by the carrier every 24 hours.

The expanded coach schedules will serve 25 major cities in Eastern's network covering 24 states and Puerto Rico.

Example: Between New York and Miami, one of the carrier's most lucrative runs, there have been three daylight and two night coach flights. Now the

number goes to eight, half day, half night.

► **Increased Service**—Cities that will receive improved EAL coach service under the new schedules include Pittsburgh, Birmingham, San Antonio, Houston and Jacksonville. Washington and Atlanta service will be doubled, and the increase will mean both day and night coach service to Philadelphia, Baltimore, Louisville, and Charlotte, cities that have had day coach only.

Additional daytime coach flights will be between New York and Houston, New Orleans, St. Louis and Puerto Rico, and between Miami and Boston, Chicago, Detroit and St. Louis.

But no coach "shuttle" between Washington and New York is contemplated. "Cost would be too great for such a 'shorthaul' operation," Rickenbacker comments.

► **DC-7s Coming**—Just a year from now, Eastern will receive a fleet of Douglas DC-7Bs, but they will be used in first-class service to move speeds "still further" into the 350-400-mph. level, EAL says.

(Rickenbacker does not look for the advent of commercial jet transports "short of 1960.")

In the meantime, the carrier sees the new push on coach operation as one facet of its "program for gearing its operations to this period of economic readjustment."

The other consideration is its putting into first-class service of a $30-million fleet of Turbo Compound Super Connies—its answer to the public demand for "more for their money."

Sked Revenues Top Record $1.2 Billion

Passenger traffic accounted for about 82% of total scheduled airline revenues during 1953, Air Transport Assn. reports in a final statistical study for the year.

In 1952, the percentage was 80.22. The airlines carried 31.5 million passengers more than 18 billion passenger-miles, a gain of 14% in passengers and 16% in mileage.

Mail ton-miles totaled 96,950,000, 6.2% higher than last year. Express and freight amounted to 251,373,000 ton-miles, a 12.5% increase.

Operating revenues in 1953 topped the previous year by 13%, increasing to a new high of $1,278,548,105.

Aircoach service showed more growth in 1953 than any other single segment of scheduled airline operation, ATA says.

This class of traffic has grown from about 251 million passenger-miles in 1949 to nearly a total of 4 billion in 1953.

VHF COMMUNICATIONS RECEIVER
SPACE ECONOMY!
SAVE MORE THAN 40% RACK SPACE! A standard 66" rack will hold only 7 ordinary VHF receivers. 12 SCHUTTIG S220A receivers will fit in this same rack! The SCHUTTIG receiver requires only 5¼ inches of vertical rack space as contrasted with 8¾ inches for other VHF receivers. The S220A is competitive in price, too!
SELECTIVITY: Bandwith is ±20 Kc 6 db down; ±100 Kc 60 db down.
SENSITIVITY: 1 MICROVOLT modulated 30% provides 1 watt with 10 db S/N ratio!
OUTPUT: 3 WATTS; feeds either built-in speaker or 600 ohm line.
UNSURPASSED PERFORMANCE
SCHUTTIG and CO. INCORPORATED
SCHUTTIG
5005 Calvert Road College Park, Md.

Want MAXIMUM Performance in MINIMUM SPACE and WEIGHT?
TYPE 4BQA POWER D. C.
SMALL, LIGHT—CONTACTS HANDLE HIGH CURRENT
Phil-trol
THESE Phil-trol Relays HAVE IT!
TYPE 4BQA MULTI-CONTACT D. C.
SMALL, LIGHT SENSITIVE
Phil-trol

Among the wide variety of *Standard* Phil-Trol Relays you will find many designed to solve your "special" problems . . . like the types 4BQA and 4BQA POWER shown above. While both are small, compact, lightweight units, each is designed to perform its job best.

These are but two of the many unusual Phil-Trol designed relays that will help you solve the "tough" application problems as well as the simpler ones . . . and with security in knowing you will always have dependable performance.

Send for a new Phil-Trol Catalog—today!

Phil-trol
IS THE REGISTERED TRADE MARK OF
PHILLIPS CONTROL CORP.
Dept. A.W., Joliet, Ill.
A Thor Corporation Subsidiary
Offices in All Principal Cities

Radio Telemetering Equipment

Airborne and commercial transmitting installations for pulse width and FM radio telemetering. Ground station equipment for the reception, handling and reduction of telemetered data. We are prepared to furnish standard units from production or to develop and produce special equipment to your specifications.

ASCOP

WE PROVIDE THE LEVER YOU MOVE THE WORLD

Your Inquiries are Invited. Write Today . . .
or call Plainsboro 3-4141

APPLIED SCIENCE CORPORATION OF PRINCETON

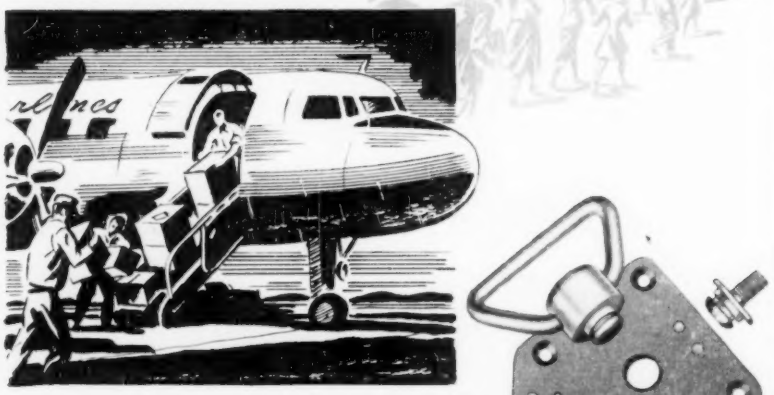
Also: High Speed Sampling Switches and Special Components and Equipment

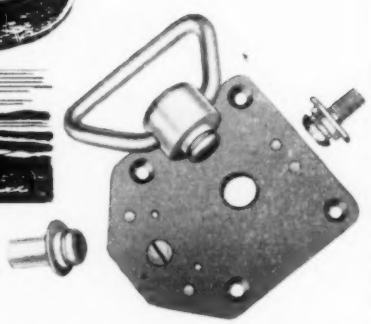
47 Wallace Road, Princeton, New Jersey

From passengers to freight

"quick change"

with **WEDJIT**





Stud or ring bolt . . . they both snap in or out with a twist of the wrist. WEDJIT'S anchor-plate contains a rugged, spring-actuated locking mechanism that holds against vibration, jolts and violent maneuvers. Equally efficient when used with electronic gear or other removable equipment, these heavy-duty, positive-locking fasteners insure built-in strength with practically instantaneous interchangeability.

How many ways can *you* use WEDJIT?

MONADNOCK MILLS San Leandro California

Subsidiary of UNITED-CARR FASTENER CORP.

Black Market

- **International ring loots airlines, reporter says.**
- **Bootleggers also to sell fighters to Red forces.**

Airlines have been victimized by an international black market ring dealing in the "bootlegging" of planes and spare parts, according to a recent article in the New York Journal-American.

In what he terms an "exclusive" report resulting from thorough investigation, Journal-American reporter Guy Richards says the ring does an estimated annual business in excess of $12 million a year in the illegal sale of planes and parts. Military equipment, too, is said to be involved.

Airline, military and government sources queried by AVIATION WEEK have not refuted the findings but decline to give further information for "security" reasons. The FBI is working on the case, they say.

▶ **Red Customers**—Two "big military deals" currently are being planned, according to the article. First is for the sale of 25 F-51 Mustangs, which would bring as much as $100,000 each, intended for an unfriendly Central American power that has been denied an export license by the U. S. State Department.

The second is for 10 Mustangs to be shipped to the Communist Viet-Minh forces in Indo-China.

Richards quotes a spokesman from the State Department, responsible for granting export licenses for all types of aircraft and parts, who said, ". . . The problem of determining who are the real buyers of the material in the deals submitted to us is one of our major concerns. It is often a very difficult task."

▶ **Systematic Thefts**—Several of the major airlines, who first believed their inventory losses in parts, instruments and other equipment were only internal theft problems, have awakened to the fact that they have been systematically victimized by the ring, notes the newspaper. They now have teamed up to help the FBI, the article adds.

Here are several typical instances cited where airlines have been "fleeced" by the black marketeers:

• **Eastern Air Lines** had a large quantity of copper sheets, copper wire, DC-4 crankcases and cylinder valves stolen at Miami recently. They were traced to a spare parts dealer in the same city. The dealer agreed to return the material, so Eastern did not prosecute.

• **American Airlines** lost 2,100 spark plugs valued at $1.50 each from its La Guardia Airport storeroom. Suspect-

ing they would find their way into the black market, AA buyers went into that market for new plugs.

They bought an equivalent number, noting that the serial numbers were close but not identical to the missing ones. However, it was soon established that the new ones bore a tape mark showing that they had been inspected and stored by Pan American World Airways—and undoubtedly stolen from PAA.

• **Trans-Canada Air Lines** had 22 cross-point indicators, worth $300 each, stolen at Montreal Airport. These finally were found in the possession of the RCAF, which had bought them from a Canadian parts dealer with American connections who claimed he had acquired them legitimately.

American also noted it was consuming 5,800 propeller de-icing brushes throughout its entire system in an eight-month period, with New York using 5,100 while the rest of the system required only 700. Security officers traced the missing brushes, through a suspect parts dealer, to storerooms of Pan American, Braniff, Western and Northwest Orient Airlines in several cities.

In another theft reported by Richards, the ring answered a distress call from Pittsburgh for a C-46 engine. The call supposedly came from a nonsked airline. An almost new engine, according to Richards' sources, was stolen from an Air Force base in Florida, flown to Pittsburgh and installed for about $4,000. The burnt-out engine reportedly was flown back to Florida to replace the stolen one.

Grace Follows PAA Lead in Panagra Suit

W. R. Grace & Co., following the lead of co-defendant Pan American World Airways, has filed its answer to the Department of Justice anti-trust suit that seeks to divest the two companies of control of Panagra.

Taking much the same stand as the one taken by Pan American (AVIATION WEEK May 3, p. 76), Grace points out that the joint ownership of Panagra had been disclosed to, acquiesced in or approved by the government through its various agencies, including Civil Aeronautics Board, over a period of many years.

The company says the relief asked by the government is "unnecessary and contrary to the public interest" and that Grace itself is not a monopoly in air transportation nor has it acquired power to monopolize.

In answer to the charge that Panagra had been restrained from developing competitively, Grace says the airline's record since it began operations in 1929, has been one of "continuous growth."

To **1954** *Aerodynamicists:*

Where will you be in **1964?**

● Will you have shifted from job to job, seeking the "right spot" and never finding it? Or will you have moved ahead steadily at one company, gaining recognition and promotion through achievement?

● The answer to those questions depends on more than ability and ambition. It also depends on opportunity . . . opportunity to show what you can do . . . opportunity to make hard work and accomplishment pay off in promotion . . . the kind of opportunity you get at Lockheed, working on such diversified projects as huge luxury airliners, jet transports, fighters, bombers, trainers, vertical rising aircraft, nuclear energy and other classified activities.

● There are other important yardsticks with which to measure a job: salary, extra employee benefits, living conditions. All standards that tell you *today's* job is a good one; all excellent at Lockheed.

● But it is opportunity that makes a Lockheed job a position of the future—a position that in 1964 will enable you to look back on a record of achievement you earned *because you had the opportunity.*

Lockheed *invites inquiries from Aerodynamicists who seek opportunity for achievement. Coupon below is for your convenience.*

Lockheed

AIRCRAFT CORPORATION

BURBANK • CALIFORNIA

Mr. E. W. Des Lauriers, Dept. AW-A-5
Lockheed Aircraft Corporation
1708 Empire Avenue, Burbank, California

Dear Sir:
Please send me your Lockheed brochure describing life and work at Lockheed in Southern California.

Name

Field of engineering

Street Address

City and State

AIRCRAFT DESIGNERS
FLIGHT TEST ENGINEERS
CONVAIR

INVITES YOU TO MAKE YOUR HOME IN BEAUTIFUL SAN DIEGO, CALIFORNIA

Here is your opportunity to move to this beautiful community — and take your place in the interesting, explorative, energetic Convair Engineering Department.

San Diego's wonderful climate, varied topography and natural beauty give to you and your family this country's finest living conditions. And the Convair Engineering Department — an "engineers" engineering department — offers you stability, plus the stimulation of challenging work on a wide variety of projects with interesting, competent associates.

Positions are now open in these classifications:

AIRCRAFT DESIGNERS: Men accomplished in structural design, power plant installation, electrical installation.

FLIGHT TEST ENGINEERS: Men accomplished in instrumentation, operations and analysis.

Moving and travel allowances will be paid. Housing plentiful and reasonable.

PLEASE WRITE: H. T. Brooks, *Engineering Personnel*,
Convair, 3302 Pacific Hiway, Dept. AW-5
San Diego 12, California

Complete details will be sent at once. All replies treated confidentially.

* Convair's widely-publicized XFY-1 . . . the new Convair delta wing vertical take-off plane designed, engineered and built in San Diego.

SHORTLINES

▶ **Braniff Airways'** operating permit in Peru has been extended by the Peruvian government for an additional five years.

▶ **British European Airways'** chairman, Lord Douglas, says the British may have to buy Sikorsky S-56s because of unavailability of U. K. helicopters before 1958 or 1960. . . . The airline and British Overseas Airways Corp. have concluded an agreement with the projected German civil airline Luftag, providing for mutual cooperation and assistance. . . . BEA also is discussing mutual arrangements for parallel routes with the Greek Airlines (TAE), including pooling of revenue and ground service facilities.

▶ **Capital Airlines** has begun one-plane through service from Milwaukee and Minneapolis-St. Paul to Miami, an interchange agreement with National Airlines.

▶ **KLM Royal Dutch Airlines** has begun two additional flights per week to Milan, Italy, giving that city five flights, three of which stop in Frankfurt. . . . KLM is offering an air cargo movie for use by traffic clubs and similar organizations free of charge. . . . The airline has received permission from the Soviet High Commission in Berlin to operate flights in and out of the East German capital. West German officials reportedly will concur.

▶ **Pan American-Grace Airways** has started new DC-6 tourist service to Argentina, with a nonstop operation between La Paz, Bolivia, and Buenos Aires. The run from Miami to the Argentine capital is scheduled to take 22 hr., 40 min., using Pan American World Airways' routes between Miami and Panama.

▶ **Scandinavian Airlines System** has opened a district sales office in Montreal, Quebec, as it expands its North American activities to Canada.

▶ **TACA International Airlines** has reduced its passenger fares from New Orleans and Mexico City to Central America and Panama by as much as 20%.

▶ **Transportes Aereos Portugueses** will begin operating from Portugal to South Africa next May, first step in a long-term project to link the country's possessions in Africa, India, Asia and Indonesia. The Portuguese airline plans to start the operation with DC-4s, will switch to Super Constellations when the new transports are delivered some time next year.

Outstanding opportunities are available for

Design Aerodynamicists

In the development of new types of Carrier-Based Aircraft with the

COLUMBUS DIVISION of

North American Aviation, Inc.

Openings for aerodynamicists with Engineering Degree plus 5 years or more experience in direct Aerodynamic Analysis. Responsible positions are available in:

- PRELIMINARY DESIGN
- METHODS DEVELOPMENT
- PRODUCTION PROJECTS

Write for Interview Appointment to

Engineering Personnel Office
COLUMBUS DIVISION

NORTH AMERICAN AVIATION, INC.
4300 E. Fifth Avenue Columbus 16, Ohio

CESSNA AIRCRAFT COMPANY

HELICOPTER DIVISION
offers unusual opportunity
for

ENGINEERING TEST PILOT

who meets the following qualifications:

must have

- **Engineering Degree**
- **Flight Test Experience**

a minimum of 1000 hours helicopter flying preferred

Send Resume To

Employment Manager
CESSNA AIRCRAFT CO.
Wichita, Kansas

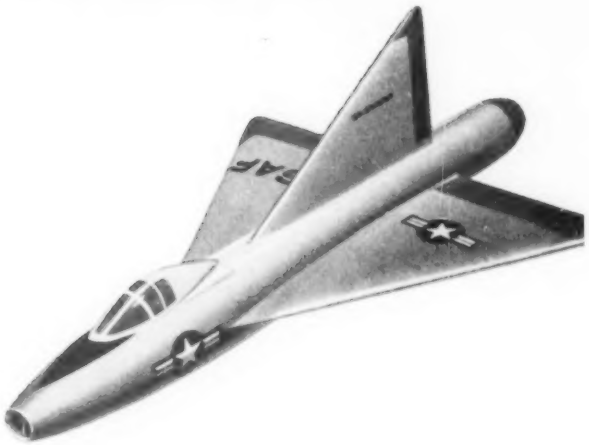
OPPORTUNITY

Division of firm engaged in development and pilot line production of solid propellant for rockets, boosters, and gas generating devices currently has openings for:

1. **MECHANICAL ENGINEER for pressure vessel and component design. Also possibility to function as project engineer.**
2. **MECHANICAL ENGINEER to take charge of static test facility. Should possess familiarity with usual electronic instrumentation.**

Initial reply should include qualifications and salary requirements.

P-2616, Aviation Week
330 W. 42nd St., New York 36, N. Y.



THE CONVAIR CHALLENGE TO ENGINEERS OF EXCEPTIONAL ABILITY

Beyond the obvious fact that Convair in San Diego offers you a way of living judged by most as the nation's finest from the standpoint of weather, beauty and interesting surroundings, the Convair Engineering Department offers you challenges found in few places.

It is, we believe, an "engineers" engineering department—interesting, energetic, explorative — with the diversity that means security for capable personnel.

As proof, consider this: Convair developed and flew the world's first turbo-prop airplane, first delta-wing airplane, first delta-wing seaplane — engineered and built the world's biggest transport, the world's safest high-performance commercial aircraft.

Or this: Convair's B-36 is the world's largest operational bomber, Convair's B-24 Liberator was World War II's most used heavy bomber, Convair's XP5Y-1 holds the world's endurance record for turbo-prop aircraft.

Or this: Convair has been awarded the nation's first production missile contract and the first production contract for supersonic interceptors.

Currently . . . Convair has the greatest diversity of aircraft engineering projects in the country, including high-performance fighters, heavy bombers, large flying boats, transports, trainers, seaplane fighters and guided missiles.

Currently. . . Convair has a completely integrated electronic development section engaged in advanced development and design on missile guidance, avionic projects and radar systems.

Would you like to join us? We earnestly need engineers of proven ability — men who want to make full use of their time, their minds, their skills and abilities solving the complex problems confronting us in these projects. If you are such a man, write us and we'll send you a free booklet about us, plus other interesting material to help you make the decision.

***Write:* H. T. BROOKS, Engineering Personnel**
Department 200

CONVAIR

3302 PACIFIC HIWAY

in beautiful San Diego, California

Wanted Immediately . . .

C54E's
FOR CASH

Give full particulars, type engines, TSO engines, airframe, configuration. Replies confidential; no brokers.

W-2666, AVIATION WEEK
330 W. 42 St., New York 36, N. Y.

DOUGLAS C-54-E

SALE OR LEASE

N4888V—80 Passenger Airliner
Now undergoing major overhaul and modification.
T.T. 12,681:00
Engines to suit user.
C.A.A. Aircarrier, licensed and radio

CONTACT: L. H. CAMERON, Stanley 7-2151
5514 SATSUMA AVE., NORTH HOLLYWOOD, CALIF.

AIRCRAFT SALES REPRESENTATIVE

Nationally known producer with established sales record of patented product used in manufacture of all aircraft desires qualified individual for key sales position to concentrate sales effort to all aircraft companies and bases in the Eastern United States.

Must be thoroughly acquainted with aircraft industry having established contacts in design, engineering, standards and purchasing departments, with proven sales ability and willingness to travel.

Position will report directly to General Sales Manager. Incentive compensation plan will enable five-figure annual income for outstanding sales performance.

Submit confidential statement of experience and qualifications as a basis for personal interview.

SW-2689, Aviation Week
330 W. 42 St., New York 36, N. Y.

AIRCRAFT ENGINEERS AVAILABLE

3 Stress Analysts, 1 Checker now working on contract which will be completed May 14th. Will work anywhere in U. S. Composite rate of $5.50/hr per man includes travel and living allowance. Min. 48 hrs/wk. Ave. exp.—11 years & Engr. Deg.

Write G. MYERS, 3328 E. MICH. AVE.
LANSING, MICH. PHONE ED-20924

BUSINESS OPPORTUNITY

WANTED: Aeronautical, Mechanical and Electronic Accessories to manufacture and sell. Cash or royalty.

ROBBINS AVIATION
1735 W. Florence Ave, Los Angeles 47, Calif.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

SALES MANAGER An established aircraft instrument and accessory manufacturer seeks a sales manager with expert knowledge of the executive transport, and military markets. The man we are thinking of should be of high caliber and should be able to point to a successful record in this field. Salary $20,000 per year. Replies held strictly confidential. P-2518, Aviation Week.

AERONAUTICAL ENGINEERS B.S. or M.S. in Aero high speed wind tunnel testing. Caltech, Personnel Office, Pasadena, Cal.

SPECIALIZED ENGINEERS. Mechanical or Chemical Engineers for Research, Development and experimental operation with experience in design or mechanisms or munitions and background in Physical Chemistry and Thermodynamics. Submit resume to: The Ralph M. Parsons Company, Facilities Operation Division, Braddock Heights, Maryland.

EMPLOYMENT SERVICE

OVERSEAS EMPLOYMENT guide for engineers, constructors & admin p'snl. Send $1 Cove-McKane Int'l. Box 126-AW NY 1, NY.

POSITIONS WANTED

CHALLENGING SUPERVISORY position—unlimited advancement 15 yrs. Consultant as Product and Tool Eng. and supervisor. College trained—not a graduate. Resume on request. PW-2577, Aviation Week.

A & E MECHANIC. Desires overseas foreign assignment with Corporation or Airline. Experience Executive aircraft, 18 years in aviation including Airlines all Phases conversion, and maintenance, age 40, available now. PW-2670, Aviation Week.

ENGINEER, YOUNG MAN with four years' experience statistical quality control desires position with airline, aircraft equipment corp., service engineering, quality control. Will relocate, travel. Presently employed. PW-2569, Aviation Week.

SELLING OPPORTUNITY WANTED

MFR'S REPR Handling Nationally distributed acft components, desires additional lines of fittings, electrical, electro-mechanical, or pneumatic products—West Coast. RA-2655, Aviation Week.

ESTABLISHED MANUFACTURERS' Representative with 12 years experience and thorough coverage of aircraft and industrial plants seeks quality tool lines. Reply Box RA-2656, Aviation Week.

FOR SALE

World's largest stock new and used aircraft parts, engines and supplies. Free Lists. Financing. Vestco, Dept. F, Box 5306 T.A., Denver, Colo.

For Sale: Three (3) R-985 — 14B Engines. O.T.S.O. by Precision Aeromotive Corporation. Standard Cylinders. Serial Numbers 227229—227300 and 227301. Price $3,500 Each. F.O.B., Houston, Texas. Baker Oil Tools, Inc., Houston, Texas, P.O. Box 3048, Telephone: WEntworth 9351, Mr. C. K. Fay.

Minneapolis-Honeywell Air pressure switches, for aircraft heater installation. Model PG-208B7, new unused, date of manufacture 1952, these switches can be reset to cover the pressure range of models B6, B8, B9, B10, etc. Price $31.50 each. Ross Aircraft Service, 4412 Bel-Air dr. La Canada, Calif. Telephone SYlvan-0-4817.

WANTED

DC-3 or C-47 Wanted. We are seeking a basically airworth DC-3 or C-47 for modification and future use as a flight test airplane. State details and minimum cash price for immediate sale. Safe Flight Instrument Corporation, 4 Water Street, White Plains, New York.

OFFICIAL PROPOSALS

Bids: June 8, 1954

Government of India

"Tenders are invited by the Government of India for the supply of Twenty-Four (24) Nos. Tender Fire Domestic and Maintenance Spares. Copies of tender sets may be obtained from the Director, India Supply Mission, 2536 Massachusette Avenue, N. W., Washington 8, D. C., on payment of $2.50 each. The bids are to be submitted direct to the Director-General of Supplies and Disposals, Shahjahan Road, New Delhi, India, so as to reach him before 8th June 1954."

FOR LEASE

TWO HANGARS

each 80 x 120 complete utilities, large lean-to.

ONE WAREHOUSE BUILDING, 19,000 sq. ft.

Concrete floor, complete utilities, loading platform, suitable for storage, light industry or shops.

TRUMBULL AIRPORT, GROTON, CONNECTICUT.

Strategically located between Boston and New York.

Three concrete runways, longest 150 x 5,000, field lighting.

Seaplane ramp, Compass locator, two large parking ramps.

FOR FURTHER INFORMATION—contact

CONNECTICUT DEPARTMENT OF AERONAUTICS

BRAINARD FIELD HARTFORD, CONN.

ENGINEERS

Attractive Positions

with

TEMCO

IN DALLAS, TEXAS

For Details See

APRIL 26 AVIATION WEEK

or Write

E. J. HORTON

Engineering Personnel

BOX 6191

DALLAS, TEXAS

EXECUTIVE AIRCRAFT SALESMAN WANTED

Person with successful sales background. Real opportunity for man who can sell twin-engine executive aircraft in the $50,000 to $100,000 price field. Salary and bonus arrangement.

Only those with successful selling experience need apply.

Write giving experience, educational background and references.

RW-2402, Aviation Week
520 N. Michigan Ave., Chicago 11, Ill.

OPENINGS IN HELICOPTER EXPRESS AND PASSENGER PROGRAM

Traffic, Materiel Control
Supply, Cargo, Accounting, Audit
Ground Operations

LOS ANGELES AIRWAYS, INC.
Box 19155 Airport Station Los Angeles 45, Calif.

playing for keeps?

Are you willing to stake the future on your belief in *you*... to match your ability against the toughest engineering challenge? Are you planning to go far in this business—and playing for keeps? If so, there may be a place for you here.

No plush inducements or summer resort accommodations. Just the opportunity to join one of the greatest creative engineering organizations in the whole new world of weapons systems development.

If it's only a job you want, the woods are full of them. But if you are one of the few who are destined to go far in this industry, you'd be wise to take an engineer's-eye view of the mindpower and the facilities you'll be working with.

Write to J. M. Hollyday, Box 988, Baltimore, Md.

Martin AIRCRAFT — THE GLENN L. MARTIN COMPANY BALTIMORE • MARYLAND

ALL AVIATION INSTRUMENTS

EMERGENCY REPLACEMENT • OVERHAUL • SALE

Instrument Associates offers you the services of their CAA approved laboratories for fast overhaul, modification and sales of aviation instruments. Whether one instrument or thousands, our production line facilities for the overhaul of instruments results in a savings of both time and money. If your instrument needs are electronic, gyroscopic or pressure, Instrument Associates can serve you.

Authorized Sales and Service for

ECLIPSE — PIONEER • KOLLSMAN • U. S. GAUGE
L. N. SCHWIEN ENG CO • EXIDE AIRCRAFT BATTERIES

CONTRACTORS TO U. S. A. F. — U. S. N. — DOMINION OF CANADA
C.A.A. APPROVED REPAIR STATION #3564
INSTRUMENTS CLASS 1, 2, 3, 4
AND LIMITED ACCESSORIES

INSTRUMENT ASSOCIATES
351 GREAT NECK ROAD, GREAT NECK, N. Y.
Telephone HUnter 2-9300

Write for Catalog NE100
U. S. Export License-3140
Western Union address: WUX Great Neck, N.Y.

NOW...for sale!

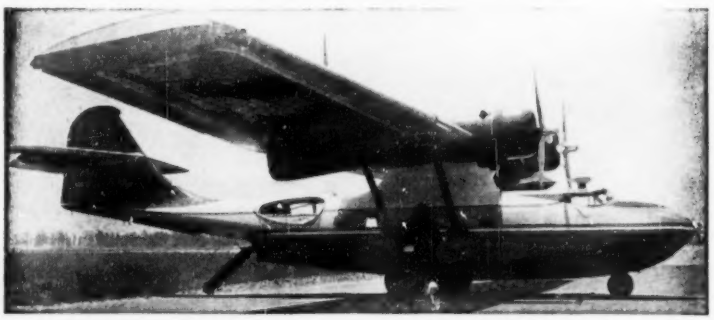
10 DC-4 Skymasters

OUTSTANDING VALUES

- 68-passenger
- Galley & 2 lavatories
- 6 with very low air time
- P. & W. CB-3 engines
- Perfect condition

Eastern Air Lines, Inc.
10 Rockefeller Plaza, New York 20, New York
or International Airport, Miami, Florida

PBY5A Specialists



Complete Overhaul & Maintenance of All Types of Aircraft

WE HAVE SEVERAL PBY5A AIRCRAFT FOR SALE
DISTRIBUTORS FOR BENDIX & LEAR RADIO
DEALER FOR COLLINS RADIO

Southern California Aircraft Corp.
Box 433 *Ph: Ontario 6-3871* Ontario, Calif

FOR SALE

Douglas—DC-3, DC-4, DC-6
Convair—240
Lockheed—Constellation
Beech—D-18S, C-18S
Lodestars—Executive Interior or For Conversion

Phone—Wire—Write

WESTAIR, INC.
WHITE PLAINS NEW YORK

SUPER-92

over **200** mph for your **DC-3**

CAA Approved R1830-SUPER-92 engines allow 700 HP normal cruise, better single engine—lower fuel and maintenance mileage costs with 20,000 extra miles between changes, with same overhaul intervals and costs as —92. Fully interchangeable with —92 —same weight, mounts, cowls, lines, etc. Proven by thousands of hours of practical executive operation.

ENGINE WORKS
LAMBERT FIELD INC. ST. LOUIS, MO.
PRATT & WHITNEY CONTINENTAL
WRIGHT LYCOMING
SALE CAA OVERHAUL EXCHANGE

FOR SALE
PBY 5A
Total airframe 2850 hours. Since overhaul 300 hours. Engine 1830-92 with 300 hours since overhaul. Good radio. Auto pilot. Cargo floor. Cargo door. Turrets faired in. Center compartment lined and carpeted. Must be sold. Make offer.
Owners, WESTAIR, INC.
White Plains, New York

FOR SALE C47A
Total airframe since new 1220 hrs Engines 1830-92, zero since overhaul Cargo configuration, bush seats, large doors, auto pilot, all modifications complied with and ready to go. Owners:
WORLD WIDE AIRWAYS INC
Montreal Airport, Canada

DOUGLAS C-47A PASSENGER

Available Immediately
P&W engines, low airframe time

Call or wire

AAXICO
P. O. Box 875 Miami Int'l. Airport
Phone 64-7653 Miami, Fla.

SPECIAL SERVICES TO THE AVIATION INDUSTRY

AIRCRAFT DEALERS

OWNER & BUYERS OF
Executive and Airline Aircraft
"Deal With Experience"
Our 30 years experience as one of the oldest and largest reputable buyers and sellers of transport aircraft should assist you in making your selection to delegate us to handle your aircraft purchase or disposal problems. Make us your clearing house for listings and inquiries.
FRANK AMBROSE
Box 181 Miami Int'l Airport. Miami 48, Fla.

Remmert-Werner, Inc.
Lambert Field, St. Louis, Mo.
Executive Aircraft

DC-3 Lodestar D18S
Conversion-Maintenance-Parts
Complete Services and Sales

PARTS & SUPPLIES

NAVCO INC.
Lambert Field
St. Louis, Mo.
TErryhill 5-1511
Has all Parts and Supplies for Executive
DC-3 LODESTAR BEECH
Airframe Engines Radios
A.R.C. Bendix Collins Lear Sperry Wilcox
P&W Continental Wright Goodrich Goodyear

C.A.B. Ltd.
49, Old Bond Street, London, W.1. England
Airframe spares for the following aircraft: Convair C240 and 340; Constellation 049, 749, 1049; Douglas DC-6 A & B, DC-4, C-47; Boeing 377. Engine spare parts for P & W 2000, 2800, 1830; Wright Cyclone R.D.1, R.A 2. C.A.B. Ltd., 49, Old Bond Street, London, W.1. Phone, Mayfair 0025. Cables, "Centaero, London".

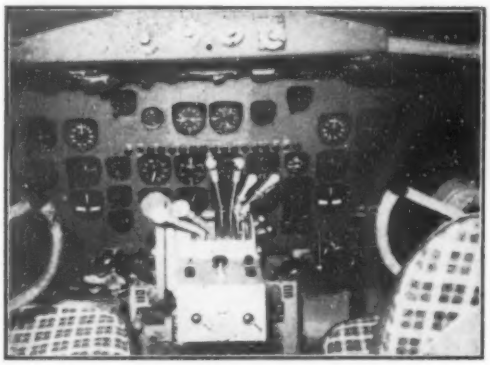
INSURANCE

AVIATION INSURANCE SPECIALISTS
RICHARD J. BERLOW & Co., Inc.
Teterboro (N. J.) Airport
HAsbrouck Heights 8-1091

IF YOU RENDER A SERVICE TO THE AVIATION INDUSTRY YOU SHOULD INQUIRE ABOUT THIS NEW SECTION!

Classified Advertising Division
330 W. 42 St., New York 36, N. Y.

systems engineering . . .



"*. . . problems involving custom design of physical layout to achieve geometric balance and systematic sequence for all controls and instruments . . . . . to provide optimum ease of operation and maximum coefficent of visibility . . . . . to conform with all standards of good practice and latest SAE requirements . . . . . to plan for future demands while achieving a system functional for present needs . . . . .*"

READING AVIATION SERVICE, Inc.
has the personnel, equipment and facilities to engineer your system to these standards.

Flight consultants and engineers can design a complete system or can recommend modifications necessary to bring your present system up to date.

Engineers, technicians, and skilled craftsmen can design, fabricate, and install radio control panels for the most complicated electronic installations.

Available for immediate installation from stock are all necessary components for automatic flight, VHF navigational aids, VHF communications, etc.

ARC	LEAR
BENDIX	NARCO
COLLINS	SPERRY
ECLIPSE	WILCOX

WE INVITE YOUR INSPECTION OF OUR FACILITIES, OUR STOCK, AND OUR WORKMANSHIP.

RAS INCORPORATED

READING AVIATION SERVICE, Inc.
Reading Municipal Airport
BOX 1201 • READING, PENNSYLVANIA

News Sidelights

Short Bros. & Harland of Great Britain have come up with a new way of letting the public know of an employment cutback. Explaining that many persons formerly employed on the Comet 2 production line would be absorbed in other work, the company adds: "Nevertheless a declaration almost at once of a substantial number of employes as redundant is unavoidable."

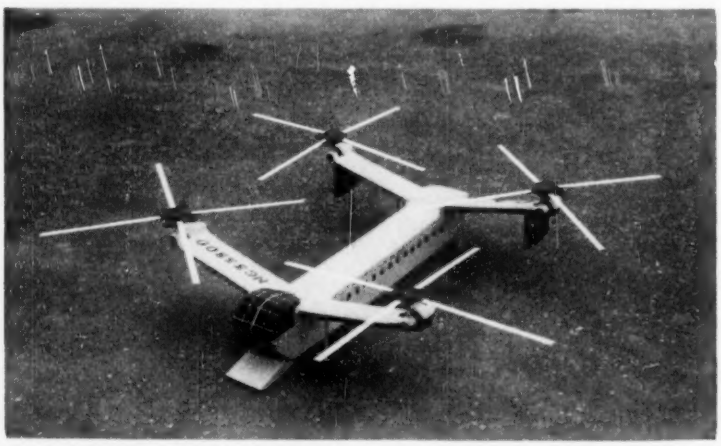
A survey of depreciation time periods for U. S. transport aircraft, based on Air Transport Assn., figures, shows that most airlines write off their newer planes in seven years. The survey reveals seven-year depreciation for the Boeing 377 Stratocruiser and the Douglas DC-6. American has figured five years for its DC-6Bs, but other airlines depreciate their Bs in seven years. American and National agree on seven years for the DC-7. The Lockheed 1049 Constellation runs between four years for Eastern and seven for TWA. Same is true for the Martin 4-0-4. On the Convair 240 and 340, all agree on seven years. The Douglas DC-4 has the greatest variance—American and Capital say five years, Northwest says three and Eastern figures one.

Land O' Lakes, Wis., population 150, this month becomes what probably is the smallest community in the nation to get scheduled air service. The village is a mecca for fishermen, so North Central Airlines plans daily operations commencing May 15—opening of the fishing season.

One suggested location for the new Air Academy can now be scratched. A major portion of Ft. Custer, near Battle Creek, Mich., has been taken over by Army Ordnance as a storage facility for machine tools. The center is to be activiated this month.

Ryan Aeronautical Co. has begun construction of a $175,000 jet engine test cell, largest in the San Diego area. Company says it will improve applications of jet propulsion of Ryan aircraft designs, "both piloted and pilotless."

British Overseas Airways Corp. will install Bendix portable airborne ignition analyzer systems in all its Boeing Stratocruisers and Lockheed L-049 and L-749 Constellations. Company ordered 22 systems through Bendix International Division, Bendix Aviation Corp.



GIANT FOUR-ENGINE COPTER shown above in model form is being proposed by Convertawings, Inc., Zahn's Airport, N. Y., to carry 76 passengers 100 mi. or 60 passengers 300 mi. Designated Model E, copter would be powered by four 1,425-hp. Wright R1820s and have 173.6 mph. top speed. Gross weight: 42,000 lb.; rotor diameter: 54.6 ft. It is designed for nose and tail ramp loading. Convertawings is completing a small two-engine Model A prototype, scheduled for first flight this month, that will be used to study control, stability and handling features of Model E.

AVIATION CALENDAR

May 10-12—Army Transportation Corps, helicopter symposium, Hotel Statler, St. Louis.

May 14-17—American Volunteer Group (Flying Tigers), biennial reunion, Belmont Plaza Hotel, New York.

May 16—Birmingham (Ala.) Aero Club, 18th annual National Air Carnival, Birmingham Municipal Airport.

May 16-19—American Association of Airport Executives, convention, Louisville, Ky.

May 17-18—National Fire Protection Assn., Aviation Seminar, Hotel Statler, Washington, D. C.

May 17-20—Basic Materials Exposition and Conference, International Amphitheater, Chicago.

May 20—Women's National Aeronautics Assn., 1954 Skylady Derby, Raton, N. M. to Kansas City, Mo.

May 21-22—Operations Research Society of America, second annual meeting, Edgewater Beach Hotel, Chicago.

May 21-23—Texas Private Fliers Assn., state convention, Galvez Hotel, Galveston.

May 24-26—National Telemetering and Remote Control Conference, sponsored by IRE, AIEE, IAS and ISA, Morrison Hotel, Chicago.

May 31-June 11—Canadian International Trade Fair, to be held in conjunction with the National Air Show and Canada's Aviation Day, Toronto.

June 2-4—Triennial industry inspection of NACA's Lewis Flight Propulsion Laboratory, Cleveland, Ohio.

June 5—Fifth annual Maintenance and Operations Clinic, sponsored by Reading Aviation Service, Inc., Reading Municipal Airport, Reading, Pa.

June 5-12—Philadelphia Junior Chamber of Commerce, second annual Transcontinental Air Cruise, Philadelphia to Palm Springs, Calif.

June 7-12—Aviation Writers Assn., 1954 convention, Roney Plaza Hotel, Miami Beach, Fla.

June 13-18—American Society for Testing Materials, annual meeting, Hotels Sherman and Morrison, Chicago.

June 16-20—International Tourist Plane Flight, held in conjunction with Fourth Centennial of Sao Paulo, Brazil.

June 18-19—Britain's National Air Races, sponsored by Royal Aero Club, Bagington Aerodrome, Coventry, England: International Trophy Race, June 18; King's Cup Air Race, June 19.

June 20-23—Aviation Distributors & Manufacturers Assn., mid-year meeting, Stanley Hotel, Estes Park, Colo.

June 21-24—Institute of the Aeronautical Sciences, annual summer meeting, IAS Building, Los Angeles.

June 24-26—American Helicopter Society, 10th annual forum, Washington, D. C.

July 3-6—Eighth annual All-Woman Transcontinental Air Race, sponsored by Ninety-Nines, Inc., Long Beach, Calif., to Knoxville, Tenn.

July 3-11—Philadelphia Glider Council, annual Open House Week; Glider Training Camp, June 11-17; both at Hilltown, (Pa.) Gliderport.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—MAY 10, 1954

A. C. SPARK PLUG DIV., G. M. C. 35
Agency—D. P. Brother & Co., Inc.
ADEL DIV., GENERAL METALS CORP. 31
Agency—The McCarty Company
AERO INSTRUMENT CO. 80
AIRCRAFT POROUS MEDIA, INC. 50
Agency—Clangio Advertising, Inc.
AIRWORK CORP. 10
Agency—Geare-Marston, Inc.
ALUMINUM CO. OF AMERICA 58
Agency—Fuller & Smith & Ross, Inc.
AMERICAN NON-GRAN BRONZE CO. 101
Agency—Norman P. Hewitt Adv.
APPLIED SCIENCE CORP. OF PRINCETON 92
Agency—Paul M. Healy Adv. Service
B G CORPORATION, THE 21
Agency—Gaynor & Co., Inc.
BILL JACK SCIENTIFIC INSTRUMENT CO. 20
BRILES MFG. CO. 72
Agency—McKee-Burns Advertising
CANADAIR, LTD. 78
Agency—Walsh Advertising Co., Ltd.
CARRUTHERS & FERNANDEZ, INC. 101
Agency—Lee Scott & Associates Adv.
CAWLEY AIRCRAFT SUPPLY CO. 56
Agency—Dale and Finkels, Inc.
CINCINNATI MILLING MACHINE CO. 25
Agency—The Keelor & Stiles Co.
COLLINS RADIO CO. 69
Agency—W. D. Lyon Co., Inc.
COMMERCIAL RESEARCH LABORATORIES, INC. 77
Agency—St. Claire Adv. Agency
CONSOLIDATED INDUSTRIES, INC. 41
Agency—Hugh H. Graham Agency
CONSOLIDATED VULTEE AIRCRAFT CORP. ..... Front Cover
Agency—Buchanan & Co., Inc.
CONSOLIDATED VULTEE AIRCRAFT CORP. 94
Agency—Barnes Chase Co.
CONTINENTAL MOTORS CORP. 75
Agency—Cummings & Hopkins Adv.
CROSLEY GOVERNMENT PRODUCTS DIV. AVCO MFG. CORP. 74
Agency—The Ralph H. Jones Company
EDISON, INC., THOMAS A. 22
Agency—Gaynor & Co., Inc.
EDO CORPORATION 48
Agency—Davis-Parson, Strotmeier, Inc.
EKSTROM, CARLSON & CO. 101
Agency—Cummings, Brand & McPherson Adv.
ELASTIC STOP NUT CORP. ..... Fourth Cover
Agency—G. M. Basford Co.
FAIRCHILD ENGINE & AIRPLANE CORP. 36
Agency—Gaynor & Co., Inc.
GENERAL ELECTRIC CO. 44, 45
Agency—G. M. Basford Co.
GLOBE INDUSTRIES, INC. 84
Agency—Weber, Geiger & Kalat, Inc.
GOODYEAR AIRCRAFT CORP. 23
Agency—Kudner Agency, Inc.
HOLLEY CARBURETOR CO. ..... Second Cover
Agency—Holden-Clifford-Flint, Inc.
HUGHES AIRCRAFT CO. 51
Agency—Foote, Cone & Belding
INDIANA GEAR WORKS 43
Agency—A. L. Perkins & Co.
INTERNATIONAL BUSINESS MACHINES CORP. 54
Agency—Cecil & Presbrey, Inc.
INTERNATIONAL NICKEL CO. 57
Agency—Marschalk & Pratt Co.
KAWNEER CO., THE 90
Agency—Fuller & Smith & Ross, Inc.
KEARFOTT COMPANY, INC. 60
Agency—F. M. Freystadt Associates
KIDDE & CO., INC., WALTER 3
Agency—Cunningham & Walsh, Inc.
KOLLSMAN INSTRUMENT CORP. 67
Agency—Schaefer & Favre Adv.
LEACH RELAY CO. 79
Agency—The McCarty Co.
LEWIS ENGINEERING CO. 55
LOCKHEED AIRCRAFT CORP. 93
Agency—Donahue & Coe, Inc.
LYCOMING DIVISIONS—AVCO MANUFACTURING CORP. 40
Agency—Benton & Bowles, Inc.
MARTIN CO., THE GLENN L. 29
Agency—Vansant, Dugdale & Co., Inc.
M B MFG. CO., INC., THE 26
Agency—Rickard & Co., Inc.
McCAULEY INDUSTRIAL CORP. 56
Agency—Hugo Wagenseil & Assoc.
MONADNOCK MILLS, UNITED CARR FASTENER CORP. 92
Agency—H. B. Humphrey, Alley & Richards, Inc.
MONOGRAM MFG. CO. 8
Agency—Taggart & Young Adv.

MONSANTO CHEMICAL CO. 81
Agency—Gardner Advertising Co.
MYCALEX CORP. OF AMERICA 28
Agency—George Homer Martin Assoc.
NORTHROP AIRCRAFT, INC. 61
Agency—West-Marquis, Inc.
OLIVER CORPORATION 70
Agency—Richard E. Putt Adv.
PACIFIC SCIENTIFIC CO. 82
Agency—Darwin H. Clark Co.
PARKER APPLIANCE CO. 52, 53
Agency—Fuller & Smith & Ross, Inc.
PASTUSHIN AVIATION CORP. 49
Agency—Lynn Western, Inc.
PHILLIPS CONTROL CORP. 91
Agency—Schnell & Assoc. Adv.
PHILLIPS PETROLEUM CO. 5
Agency—Lambert & Feasley, Inc.
PITTSBURGH PLATE GLASS CO. (SAFETY GLASS) 46
Agency—Batten, Barton, Durstine & Osborn, Inc.
REED BANK DIV., BENDIX AVIATION CORP. 38
Agency—MacManus, John & Adams, Inc.
RESIN INDUSTRIES, INC. 4
Agency—Taggart & Young Adv.
RHEEM MFG. CO. 19
Agency—Campbell-Ewald Co.
ROBINSON CO., RALPH C. 50
Agency—Chapin-Damm Advertising
RYAN AERONAUTICAL CORP. 86
Agency—Batten, Barton, Durstine & Osborn, Inc.
SAWYER & SON CO., H. M. 59
Agency—McMillan & Marsden, Inc.
SCHUTTIG & CO., INC. 91
SEARCHLIGHT SECTION 95, 96, 97, 98, 99
SERVOMECHANISMS, INC. 76
Agency—Sanger Funnell, Inc.
SOCONY VACUUM OIL CO. 27
Agency—Compton Advertising, Inc.
SPERRY GYROSCOPE CO. ..... Third Cover
Agency—Roach Yates & Mattoon, Inc.
STANDARD PRESSED STEEL CO. 6
Agency—Gray & Rogers Adv.
SURFACE COMBUSTION CORP. 32, 33
Agency—Osborne Industrial Adv.
TITEFLEX, INC. 83
Agency—John Falkner Arndt & Co.
TUBE METHODS, INC. 21
Agency—John Miller Adv. Agency
TUBING SEAL CAP, INC. 70
Agency—L. J. C. Speyrance Adv.
U. S. STEEL CORP. (U. S. STEEL SUPPLY) 39
Agency—Batten, Barton, Durstine & Osborn, Inc.
VICKERS ARMSTRONG CO. 55, 63, 101
Agency—Intam Limited
VOI SHAN MFG. CO., INC. 30
Agency—Anderson-McConnell Adv. Agency
WESTINGHOUSE ELECTRIC CORP. 68
Agency—Fuller & Smith & Ross, Inc.
WHITTAKER CO., LTD., WM. R. 65
Agency—Mogge-Privett, Inc.
WILCOX ELECTRIC CO. 85
Agency—Carter Adv. Agency, Inc.

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 95-97
Selling Opportunities Offered 96
Positions Wanted 96
Selling Opportunities Wanted 96
Employment Services 96
SPECIAL SERVICES
To the Industry 99
BUSINESS OPPORTUNITIES
Wanted 96
NOTICES
Proposal 96
PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 96, 98-99
WANTED
Planes-Equipment 96

Did you see that Passenger on page 63?

WHAT JOBS HAVE YOU for NON-GRAN Spun CENTRIFUGAL CASTINGS

- Improve Products
- Increase Sales!

Get details—request booklet!

AMERICAN NON-GRAN BRONZE CO.
Berwyn, Pa.

SOLENOID OPERATED
3 Way -- 2 Position Valve

For use with various fluids. • Hydraulic Line operating pressure: 150 PSI. • Proof pressure: 300 PSI. • Voltage: 18-30 VDC. • Amperes: .5. • ENERGIZED: Pressure port open to cylinder, return port sealed. • DE-ENERGIZED: Pressure port sealed, cylinder port open to return. • Ambient: —65° to + 250° F.

NOTE: All of above specifications as well as configuration can be changed to meet specific requirements.

Call on C&F for design and engineering service for special applications.

Write today for C & F's descriptive catalogue of Electrical and Hydraulic Control Equipment.

Carruthers & Fernandez, inc.
1500 Colorado Ave. Santa Monica, Calif.

EASY-CUTTING
EKSTROM, CARLSON

EKSTROM, CARLSON & CO.
1400 Railroad Ave., Dept. A-4
Rockford, Illinois

MANUFACTURERS OF AIRCRAFT PRODUCTION MACHINERY

EDITORIAL

Capt. Rickenbacker Dissents

While some of his fellow airline presidents quietly were exploring possibilities of increasing fares, Capt. E. V. Rickenbacker decided to stage a press conference last week to tell the world his Eastern Air Lines, beginning May 16, will offer more than 50% of its trunkline service as lower-fare coach operations.

That decision, coming from the industry's champion money-squeezer and revenue-chaser, should be a warning to those who are more interested in raising profits than filling their airplanes.

The nation's airlines are going to have to readjust their service pattern in keeping with the new look in the country's economy, Rickenbacker contends stoutly.

"The result of the industry's first-quarter operations points up the impact that the country's broad economic readjustment has already had on the airlines," he says. "These results should not have surprised anybody. They were forecast months ago. Technical advances within the industry, however, have brought the airlines to a critical point in their development under the very guns of the changing trend in the economy.

"Whether the industry wants it or not, these factors are forcing us into becoming a system of mass transportation. The so-called first-class travel market is not slipping. It is simply no longer capable of being expanded at a rate required either to make profitable use of the equipment available, or to provide a market broad and stable enough on which to project even more expensive jet-powered transportation the industry must absorb five or six years from now.

"In my opinion, this type of low-cost public service is certain to replace the so-called first-class market as our primary source of revenue before many years."

For years, Eastern has been the largest domestic operator of aircoach, but less than 20% of its schedules have been used for this service, he said.

Capt. Rickenbacker is under no illusions about his profit rate, let his fellow airline presidents note.

"We won't make the money we made a year ago, but we hope for a reasonable profit," he said.

"In my opinion, although revenue from aircoach operations is substantially less per passenger-mile than that produced by regular fare tariffs, the wide appeal of this lower-cost service will produce a dollar volume of new business more than sufficient to offset this differential."

The Eastern board chairman emphasized the need for "a subsidy-free and expanding system of air transportation."

He remarked pointedly that he was against raising fares when business is tight.

Rickenbacker believes there is no question that if costs continue to climb, prices also will climb, and in such a period of readjustment "people just aren't going to spend the money they did, or at the rate they did."

By the end of next year, perhaps 65% of Eastern's operations will be coach, he said. There will be no curtailment of first-class flights with the new policy May 16.

Capt. Rickenbacker confounds his industry again.

Lear Sticks Out His Chin!

That dynamic phenomenon, William P. Lear, shuttles about the country making news much of the time, and his address in Los Angeles the other day was no departure from custom.

Bill Lear, who will sell you a revved-up executive plane in a trice, stuck out his chin in characteristic fashion and forecast a ten-fold spurt in the number of business aircraft during the next 10 years, from 8,000 planes to 80,000.

The chairman of the board of Lear, Inc., may turn out to be right. We fervently hope so. Addition of Bill's selling energy alone may get the figure up that high!

AVIATION WEEK, however, still refuses to accept as gospel the "statistics" on business aircraft bandied about by Civil Aeronautics Administration and the National Business Aircraft Assn.

Mainly because of the inadequacy of CAA's official figures, no one knows how many aircraft really are used for business. We don't know—and neither does anyone else—how many hours of business flying this indeterminate total of planes runs up a year, despite estimates CAA and others put forth for the press.

We can find big, gaping holes and inconsistencies in official but unsubstantiated data. There is evidence of considerable guessing. Even the strongest defender of CAA figures wound up a rebuttal of our position with an apology to the effect that the data available for 1952 are not as "complete or as accurate as we would like to have them." That's about the point of our various discourses here.

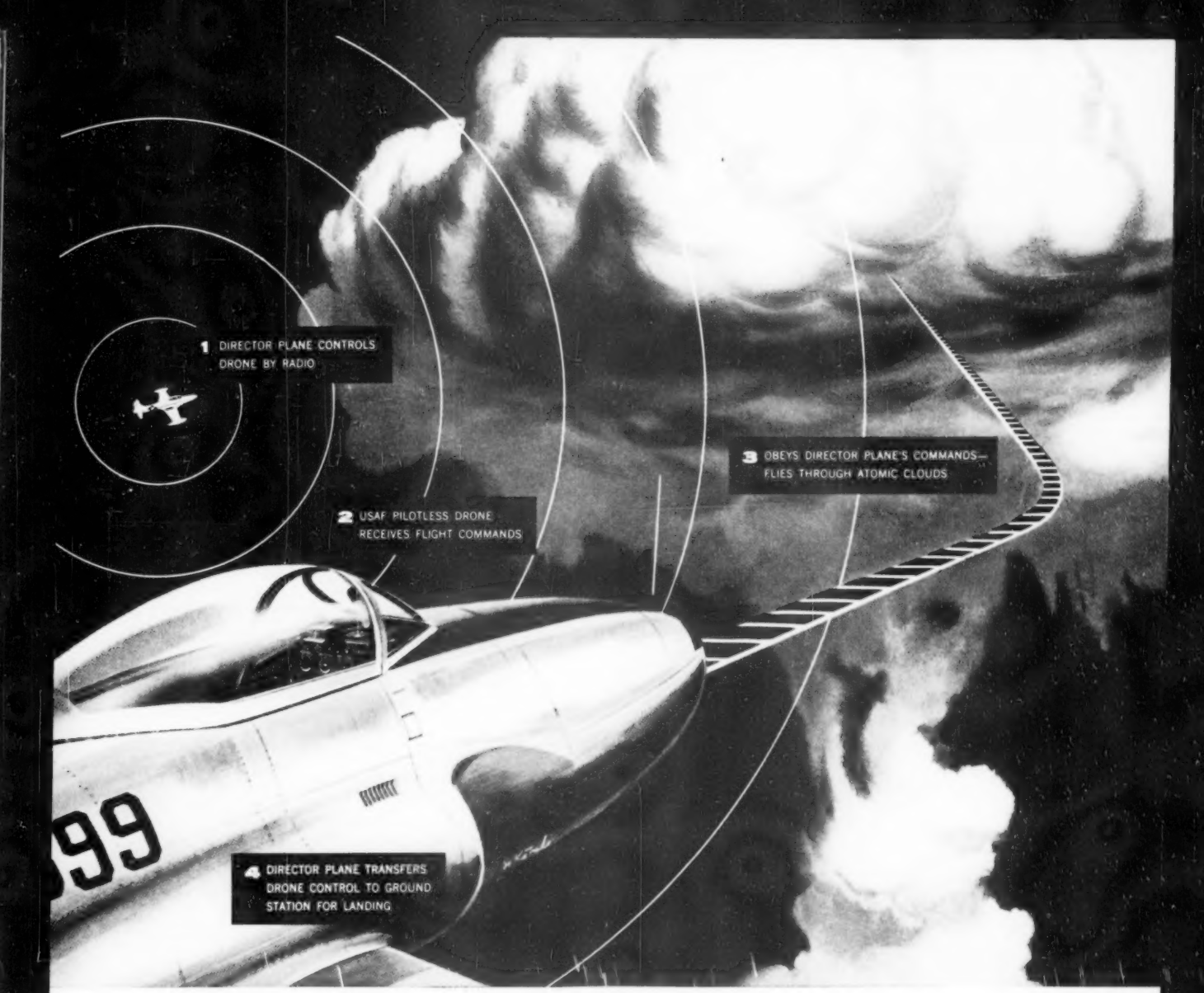
One of our magazine contemporaries which has accepted and publicized CAA and NBAA estimates, without digging into the source material, propounded the astonishing editorial policy that "to unnecessarily destroy confidence in any organization that is working for aviation is bad for the industry." There has been too much of that kind of philosophy in the history of aviation journalism.

It is our view that no one, even if "working for aviation," deserves confidence he doesn't merit. Truth —not motive—is the prime consideration. Is truth "unnecessary"? Aviation can't be built upon untruth or misleading basic information. A lot of people may be "working for aviation" who are not necessarily right or well directed, and those who aren't right or sound are doing no service to aviation. Aviation had more than its share of phonies and parasites in its early days and we rejoice in the decimation of their ranks.

Those who are interested in a fuller summary of AVIATION WEEK's views of the business flying picture will find it in the March 15 issue. In the meantime you can bank on it that those who still attempt to defend CAA figures on this important subject have never made a study of the source material that gives rise to the publicized totals, or talked to the people who add up the figures and "make the required assumptions and allowances." We have.

But we still hope Bill Lear's prophecy is right!

—Robert H. Wood


1 DIRECTOR PLANE CONTROLS DRONE BY RADIO
2 USAF PILOTLESS DRONE RECEIVES FLIGHT COMMANDS
3 OBEYS DIRECTOR PLANE'S COMMANDS— FLIES THROUGH ATOMIC CLOUDS
4 DIRECTOR PLANE TRANSFERS DRONE CONTROL TO GROUND STATION FOR LANDING

Pilotless Jets Penetrate Atomic Cloud in Tests

BRING BACK DATA PREVIOUSLY IMPOSSIBLE TO SECURE

THE STORY BEHIND THE STORY:

■ Mix the drama of atomic tests and pilotless flight and it's page one news. Such was the case when the U. S. Air Force thrust pilotless jet drones into the heart of atomic clouds and landed them safely – with their cargo of mice and monkeys – for scientific study by the Atomic Energy Commission.

■ The story behind the testing of the effect of radiation on animals is one of pilotless flight, "beep" pilots and precise Sperry controls. Lockheed QF-80 drones, specially equipped with Sperry remote flight control systems, fly through atomic clouds guided by radio and radar.

■ These drones are flown remotely by skilled USAF pilots who use "beep" boxes to command them – either from director planes in the air or control stations on the ground for take-off and landing. Under their radio commands the drone takes off, at the proper speed retracts its landing gear, climbs to the desired altitude, banks and turns and keeps the airspeed necessary to arrive at an exact point in the atomic cloud at a prescribed second.

■ This remarkable flight control system brings the drone through the awesome turbulence of the atomic cloud under complete control—on course and altitude. Returning to its airbase, the radiation-saturated drone lands as precisely as though a veteran pilot were at its controls.

■ Sperry is an old hand at pilotless flight. It developed the first guided missile—an aerial torpedo for the Navy – back in 1915. And since 1912, Sperry has been the leader in developing automatic flight controls for *piloted* flight. Sperry automatic pilots are installed on military and commercial planes the world over.

SPERRY GYROSCOPE COMPANY

DIVISION OF THE SPERRY CORPORATION • GREAT NECK, N.Y.

E B POWER GS H
UNIVERSITY MICROFILM INC
313 N 1ST ST
ANN ARBOR MICH C

What shape is a quality fastener?

Here is a handful of ELASTIC STOP® nuts. Each has ESNA's familiar red locking collar . . . is self-locking and vibration-proof. Each is a readily assembled, one-piece unit. Each provides positive protection against thread corrosion . . . prevents liquid seepage along bolts. Each is made from the finest of raw materials. Each is exactly controlled as to finished dimensions, class of thread fit and finish. Each is now in use on critical applications, with a record for uniform high quality that is unmatched.

Most of them are standard parts. Some originated as the result of a specific request for ESNA's help with an important fastening problem.

Isn't it logical to call on us with your next fastening problem?

ELASTIC STOP NUT CORPORATION OF AMERICA

ESNA® TRADE MARK / ROLLPIN TRADEMARK

Elastic Stop Nut Corporation of America
Dept. N62-525, 2330 Vauxhall Road, Union, N. J.

Please send the following free fastening information:

☐ ELASTIC STOP nut bulletin

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name_____ Title_____

Firm_____

Street_____

City_____ Zone_____ State_____